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Advanced Tactical Engagement Simulation Concepts (ATESC)

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14. ABSTRACT *(Maximum 200 words)*:

Trainers for force-on-force training exercises at the Army's maneuver combat training centers and at home station are often distracted from coaching and mentoring responsibilities by the need to perform exercise control and feedback (CAF) functions. The fielding of new weapons and reconnaissance, surveillance, and target acquisition (RSTA) systems as part of force modernization will overwhelm trainers with new requirements unless improved concepts for tactical engagement simulation (TES) and instrumentation systems (IS) are implemented . This study produced an online database that was used to assess the benefits of implementing various new TES and IS concepts, or combinations of concepts, in terms of the number of CAF functions automated, the extent to which each function disrupts trainer coaching and mentoring activities, the number of gaps in training feedback addressed, and the number of systems to which each function or feedback gap applies. The TES and IS concepts we evaluated were designed to address the additional goal of avoiding the stove-pipe nature of past systems. The online database can be used to examine the benefits of additional TES and IS concepts. The study sponsor is using the results to define requirements for future TES systems and IS for live training at CTCs and home stations.

15. SUBJECT TERMS Tactical Engagement Simulation (TES) Instrumentation Systems After Action Review (AAR) Intrinsic Feedback Extrinsic Feedback National Training Center (NTC) Maneuver Combat Training Centers Home Station Training Force-on-Force Training Force XXI Embedded Simulation

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FOREWORD

The ARI Simulator Systems Research Unit (SSRU) conducts research and development and performs studies on training requirements for advanced training systems, devices and simulators. SSRU provides assistance to the U.S. Army Simulation, Training and Instrumentation Command (STRICOM), and the U.S. Army Training and Doctrine Command (TRADOC) in test and evaluation activities, training requirements definition, development of device specifications, and evaluation of training equipment concepts. An important area addressed by the unit is the development of automated systems to support exercise control and feedback for collective training exercises.

The current study was conducted in response to a request from the TRADOC Army Training Modernization Directorate (ATMD) to develop an online database for use in evaluating the benefits of implementing specific concepts, or combinations of concepts, for new tactical engagement simulation (TES) and instrumentation systems (IS). New TES and IS are needed to help trainers for live force-on-force exercises address the explosive growth of exercise control and feedback (CAF) functions associated with force modernization. The study includes a trial application of the online database to fifteen high level concepts for improved TES and IS systems. The results of this study are being used by TRADOC to write requirements for future TES and IS systems for the Army's maneuver combat training centers and for home stations. This work was briefed at the U.S. Army Training Support Center on 17 December, 1998 to an ATMD audience that included COL William Jones, Mr. George Burns, and Mr. Terry Faber. The U.S. Army's Simulation, Training and Instrumentation Command's Project Manager for Live Simulation Systemss, LTC Chuck Gault, and representatives of the U.S. Army's National Simulation Center also attended the briefing.

Zita M. Simutis

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ADVANCED TACTICAL ENGAGEMENT SIMULATION CONCEPTS (ATESC)

EXECUTIVE SUMMARY

Requirement:

The Army Training Modernization Directorate (ATMD) Report on Live Domain Research Requirements states that force modernization initiatives "will make current training support systems obsolete" and predicts a spiraling workload for trainers and degradation in combat readiness if action is not taken to upgrade support for live training. In response to a request from ATMD, ARI previously conducted the Training Analysis and Feedback Aids (TAAF-Aids) for Live Training Support Study to describe the impacts of over 140 new and emerging systems on exercise control and feedback (CAF) functions performed by trainers in live force-on-force exercises. This study concluded that trainers would be overwhelmed by CAF functions in the absence of interventions and identified high level concepts for using automation to assist trainers. ATMD identified the need to go beyond the TAAF Aids study and quantify the benefits of implementing particular concepts or combinations of concepts for improving tactical engagement simulation (TES) and instrumentation systems (IS) to support training at the Army's maneuver combat training centers (CTCs) and at home stations.

Procedure:

The goal of the first phase of this study was to refine the list of CAF functions that would be performed to support training for units using new and emerging weapon systems and reconnaissance, surveillance, and target acquisition (RSTA) systems. We interviewed approximately seventy of the National Training Center observer/controllers (OCs) and analysts that had participated in the Force XXI Advanced Warfighting Experiment (AWE) in which many of the new weapon and RSTA systems had been employed. We also reviewed the Army Science and Technology Plan documents for FY97 and FY98 to make sure we were addressing the most up to date concepts for new systems. At the conclusion of this phase of the effort we had identified 228 CAF functions likely to be performed in support of training the modernized force, with many of the functions being performed in relation to more than one weapon or RSTA system. We also identified over 100 cases where elements of feedback needed to cue and guide unit employment of systems during exercises or help units identify corrective actions for future mission performance would not be provided to units, in the absence of intervention.

The goal of the second phase of this study was to build an online database for use in assessing the value of any particular TES/IS concept or combination of concepts. The first objective was to identify CAF functions with a high payoff for automation. The database included ratings for each function with respect to such variables as the number of trainers involved in performing the function, the impact on the trainer's ability to observe the unit, and the potential to overwhelm the trainer. The second objective was to identify critical gaps in training feedback. The database also identifies the specific system(s) to which each CAF function or feedback gap applies. Our intent was to provide a database that could be used to compare concepts for new TES/IS systems in terms of the high payoff CAF functions supported and critical gaps in feedback addressed.

The goal of the third phase was to apply the online database in examining the value gained from implementing the high level TES/IS concepts developed within the previous TAAF Aids study. In addressing this goal, we expanded upon the previously developed TES/IS concepts.

Findings:

We confirmed that for many existing and emerging tactical systems the live training environment cannot simulate or provide AAR feedback about unit employment of these systems without major enhancements to TES and IS. Exercise CAF functions will overwhelm trainers for those systems the CTCs can simulate. During an analysis of 155 tactical systems, the study derived and prioritized 228 CAF functions. The analysis also identified 96 critical feedback elements, which are currently unattainable at the CTCs. The study formulated and prioritized 15 TES concepts to overcome identified shortfalls. Successful implementation of the first three concepts automates 62 percent of the CAF functions performed and eliminates 58 percent of the feedback deficiencies.

Utilization of Findings:

The online database can be used to support quantitative comparisons of particular concepts or combinations of concepts for improving TES and IS. At the request of STRICOM's manager for the Advanced TES Science and Technology Objective (STO), this report and database will be made available on the world wide web to guide the growth of the TES/IS technology base. The results of this study will also be used by ATMD in writing requirements for TES and instrumentation systems.

ADVANCED TACTICAL ENGAGEMENT SIMULATION CONCEPTS (ATESC)

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Advanced Tactical Engagement Simulation Concepts (ATESC)

Introduction

Purpose

Trainers for live force-on-force exercises have traditionally faced a heavy workload. These trainers must often spend substantial efforts during exercises helping to simulate the effects of weapon systems. They must also expend substantial effort collecting and analyzing data to provide units with feedback.

The workloads of trainers for live exercises can be reduced to the extent that tactical engagement simulation (TES) systems and instrumentation systems (IS) help to simulate weapons effects and collect and analyze data for performance feedback. The TES system simulates the employment of a weapon system during force-on-force training between the unit being trained (BLUFOR) and a live opposing force (OPFOR). For example, to simulate direct-fire engagements, weapons are equipped with a TES system called the Multiple Integrated Laser Engagement System (MILES). MILES emits an eye-safe laser when the soldier fires the weapon. MILES sensors on soldiers and equipment detect engagement by the laser and produce an audio and/or visual cue for a kill, hit or near miss.

The IS is an electronic data collector that monitors position location and the TES devices on soldiers and vehicles and captures exercise player activity. The IS provides data that workstations convert into computer-generated graphics providing a top-down view of player location, status (alive or dead), movement, firing activity, etc. The IS also records BLUFOR tactical voice communications, supports trainer exercise control communications, and displays video from mobile video crews in the exercise area.

The current method for simulating indirect-fire and area weapons, the Simulated Area Weapons Effects (SAWE), is a blending of TES and an IS. SAWE simulates artillery, mortars, chemical attacks and minefields. SAWE compares the location of exercise players with the area affected by the ordnance and assesses casualties and battle damage electronically.

The purpose of the present study is to develop and prioritize high level concepts for future TES and IS. This study is one of a series requested by the Army Training Support Center (ATSC) Army Training Modernization Directorate (ATMD). ATMD is responsible for writing the requirements for training resources to support training in the live force-on-force and live fire training domains at the Army's maneuver combat training centers (CTCs) and for home station training. The maneuver CTCs include the National Training Center (NTC), the Joint Readiness Training Center (JRTC) and the Combat Maneuver Training Center (CMTC).

Terminology

Before we discuss study methodology and findings, we will define some terms used extensively throughout the report. (See Appendix A for a list of acronyms and abbreviations.) NOTE: Unless stated otherwise, whenever this report uses the masculine or feminine gender, both are intended.

Observer/Controller (OC)

The OC is a tactically and technically competent officer or non-commissioned officer who serves as trainer, observer and exercise controller. He monitors safety, enforces rules of engagement, assesses casualties and battle damage, observes critical tactical events, performs one-on-one coaching, conducts after action reviews, and submits input to the training unit's take home package (THP). OCs at the Army's maneuver CTCs perform OC duties on a full-time basis. Occasionally, personnel from tactical units, TRADOC schools and Reserve Component advisors perform OC duties to augment CTC OCs. At homestation installations, tactical units appoint personnel who are not participating in the exercise to perform OC duties for the training unit.

Training Analysis Facility (TAF) Analyst

At the CTCs, a TAF equipped with computer workstations supports analysts who use a top-down view of the exercise, video, and player tactical voice and digital communications to observe and analyze unit performance. The TAF analyst may be an officer, non-commissioned officer, Department of the Army (DA) civilian or contracted civilian. Each TAF

analyst is paired with a counterpart OC (i.e., a company team [Co Tm] analyst paired with a Co Tm OC). Working as a team, the OC and TAF analyst control the exercise, exchange observations on player activity, and identify the causes and effects that led to tactical outcomes. Before, during and after the exercise the TAF analyst prepares AAR products to support the OC's AAR presentation. The analyst also integrates OC input and produces the THP for the training/rotating unit.

NOTE: In this report, we use the term "trainers" to refer to OCs and TAF analysts collectively.

Intrinsic Feedback

Intrinsic feedback is "down range" feedback provided to exercise players during the exercise as they interact with their tactical systems and other players. Intrinsic feedback stimulates the senses (primarily sight and hearing) and cues the players to react to a condition or combination of conditions.

For example, feedback on the location of impacting artillery provides cues to players so they may determine the accuracy of fires and the need to adjust fires. Intrinsic feedback may be real or simulated. See Figure 1.

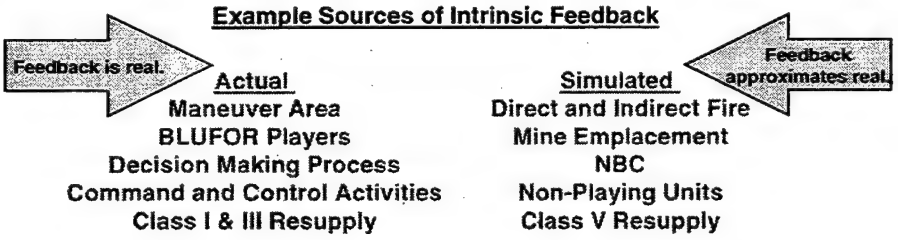


Figure 1. Example sources of intrinsic feedback.

Actual terrain influences player maneuver, exercise players interact with other real players, commanders (Cdrs) respond to appraisals provided by real battle staffs and staff members interact with real digital information systems. However, due to safety or cost constraints, many entities and activities are simulated, such as:the visual (flash); audio (bang); and casualty-producing effects of weapons; a notional higher, supporting or adjacent unit; and ammunition resupply.

Figure 2 provides an example of simulated intrinsic feedback from a direct-fire engagement.

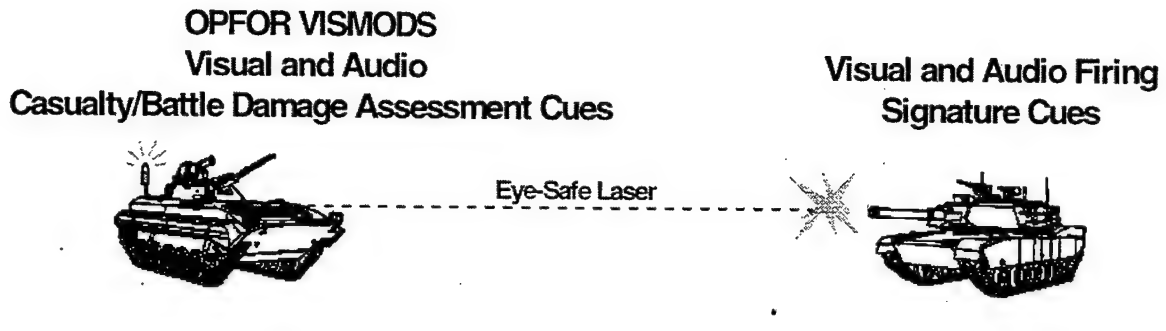


Figure 2. Intrinsic feedback from a simulated direct-fire engagement.

The live OPFOR visually modified (VISMOD) vehicle provides the BLUFOR crew the intrinsic feedback needed to distinguish enemy vehicles from friendly vehicles. The TES system simulates the flash and bang of the firing BLUFOR vehicle creating a signature for acquisition by the OPFOR vehicle. The BLUFOR vehicle TES system also emits a harmless, eye-safe laser during the engagement. Sensors on the OPFOR vehicle detect the strike of the laser beam and actuate a continuously blinking amber light simulating a vehicle kill. The blinking light informs the OPFOR crew that their vehicle is out of action and notifies the BLUFOR crew that they destroyed the OPFOR vehicle. Both the firer and the victim received real and simulated intrinsic feedback on their actions during the engagement. The firer received feedback indicating that his fires were accurate. The victim received feedback indicating that his use of cover and concealment was inadequate.

Exercise Control

When the TES system fails to provide intrinsic feedback based solely on BLUFOR and OPFOR actions, OCs and TAF analysts perform control actions to provide player personnel the needed feedback. See Figure 3 for an example of exercise control.

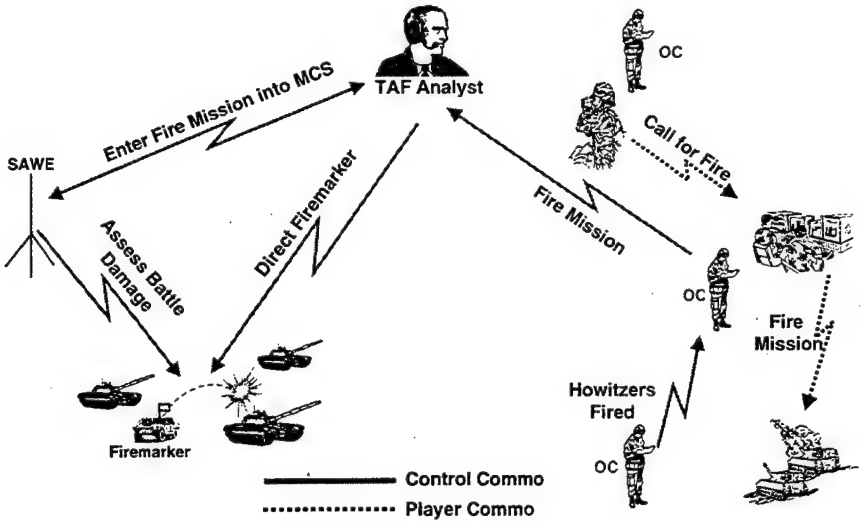


Figure 3. Example of exercise control.

The MILES TES system is not capable of simulating non-line-of-sight (NLOS) engagements. Consequently, BLUFOR and OPFOR actions alone will not cause the engagement nor adjudicate the results of the engagement. Figure 3 provides an illustration of the complex control procedures necessary to provide intrinsic feedback to exercise players for NLOS engagements, in this case, an artillery fire mission.

To produce the appropriate battlefield effects and battle damage/casualty assessments for indirect-fires, trainers must perform extensive control actions:

(1) The OC collocated with the forward observer (FO) monitors the FO's call for fire.

(2) The OC, collocated with the howitzer platoon fire direction center (FDC), observes the FDC's procedures in determining fire mission data. The FDC OC also passes the target location, projectile type, number of projectiles to be fired, and firing unit(s) to the TAF analyst for entry into the TES system--SAWE.

(3) A firing platoon OC observes the actions of the howitzer platoon in laying the howitzers and preparing ammunition for the fire mission. The firing platoon OC notifies the FDC OC of whether or not the firing platoon performed all procedures correctly.

(4) The FDC OC directs the TAF analyst to fire the mission in SAWE after receiving notification from the firing platoon OC that the howitzers have fired. If there are any errors by the FDC or the howitzer platoon, the FDC OC informs the TAF and the TAF analyst adjusts the point of impact for the fire mission accordingly.

(5) The TAF analyst executes the mission in the SAWE control station. SAWE assesses casualties and battle damage for the fire mission and generates an indirect-fire vector on the analyst's top-down view of the exercise. Concurrently, a second analyst notifies a Firemarker to mark the location of the impacting ordnance to provide the visual and aural effects to players in the target area. NOTE: Fielding of the Direct/Indirect-fire Cue (DIFCUE) will provide aural and visual cues for indirect-fires impacting in the vicinity of mounted forces. The DIFCUE, which will be mounted on tactical vehicles, will set-off pyrotechnics when signaled by SAWE. The DIFCUE will begin fielding in FY99 (Department of the Army, 1998a). However, for indirect-fires against dismounted soldiers, firemarkers will continue to use artillery simulators to simulate impacting or air-bursting ordnance.

After Action Review (AAR)

The AAR is a dynamic discussion among the BLUFOR exercise players following an exercise in which the key leadership of the unit strives to determine--what happened, why it happened and how to improve performance. An AAR facilitator/leader, trainer or OC guides BLUFOR players in their discussions. In this study plan, we refer to the AAR facilitator/leader as the OC. The OC guides player discussions to establish the causes and effects that led to the tactical outcome through the use of various multimedia displays or AAR aids. These AAR aids present the tactical mission, task standards and unchallengeable "ground truths" on BLUFOR's performance.

AAR aids display the unit's plan (what was supposed to happen), identify what happened during mission execution and stimulate player discussions on why it happened. During these discussions, BLUFOR players learn from their mistakes and benefit from the lessons learned by other players. The AAR, in effect, becomes the bridge between the completed training event and the next training event,

providing post-exercise learning on how to improve that enables leaders to fix training weaknesses.

Extrinsic Feedback

Extrinsic feedback is that feedback provided to the BLUFOR in the form of AARs, coaching and unit take home packages. See Figure 4.

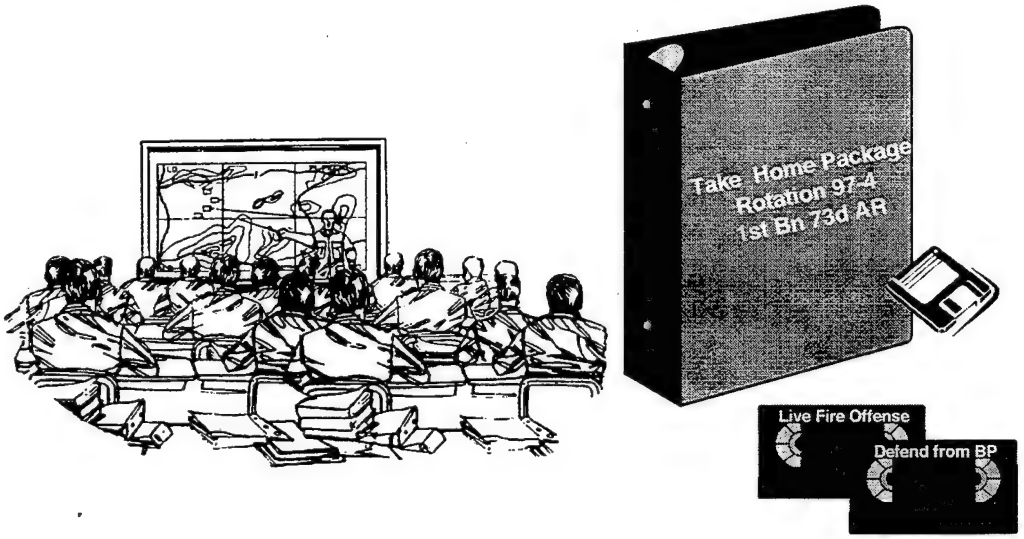


Figure 4. Extrinsic feedback.

Background

TRADOC Report on Live Domain Research Requirements

The genesis for the Future Live Simulation CAF Concepts Study is the TRADOC Report on Live Domain Research Requirements prepared by ATSC-ATMD (Faber, 1996). The report states that force modernization initiatives in the Army Science and Technology Master Plan "will make current training support systems obsolete." The report predicts a spiraling workload for trainers and degradation in combat readiness if action is not taken to upgrade support for live training. The ATSC report lays out a high-level research plan for live training to resolve projected deficiencies through a number of studies. The Training

Analysis and Feedback Aids (TAAF Aids) Study for Live Training Support completed in 1997 was an ARI study conducted in response to a request from TRADOC ATSC.

Training Analysis and Feedback Aids (TAAF Aids) Study

The TAAF Aids Study drew upon the experiences of OCs and analysts at JRTC and CMTC, as well drawing extensively upon the knowledge of U.S. Army Simulation, Training and Instrumentation Command (STRICOM) engineers familiar with the capabilities of current TES and IS. The TAAF Aids Study determined the impact of force modernization on future exercise control and training feedback functions during live simulation training (Brown, Nordyke, Gerlock, Begley II, and Meliza, 1998)). TAAF Aids concluded that control and feedback requirements imposed by emerging tactical systems will overwhelm OCs and TAF analysts without a corresponding upgrade to tactical engagement simulation and instrumentation systems. TAAF Aids also found there will be substantial gaps in both the intrinsic and extrinsic feedback needed by units as they employ new tactical systems. The study offered 13 strategies to reduce the burden on OCs and TAF analysts and improve training analysis and feedback for BLUFOR units.

Figures 5 and 6 provide an example TAAF Aids analysis for intrinsic feedback requirements. In the TAAF Aids analysis, we identified the intrinsic feedback the soldier or crew will receive during actual employment of the combat system. We contrasted our analysis results with the capabilities of the TES, IS, OCs and TAF analysts to provide the feedback and identified the shortfalls. Recall that intrinsic feedback is "down-range" feedback provided to exercise players during the exercise as they interact with their tactical systems and other players. Intrinsic feedback consists of those real or simulated entities or activities that stimulate the senses of the players and cause them to react to a condition or combination of conditions. Also recall that when the TES system fails to provide "down-range" feedback for simulated conditions based solely on BLUFOR and OPFOR actions, OCs and TAF analysts must perform control procedures to stimulate/cue exercise players.

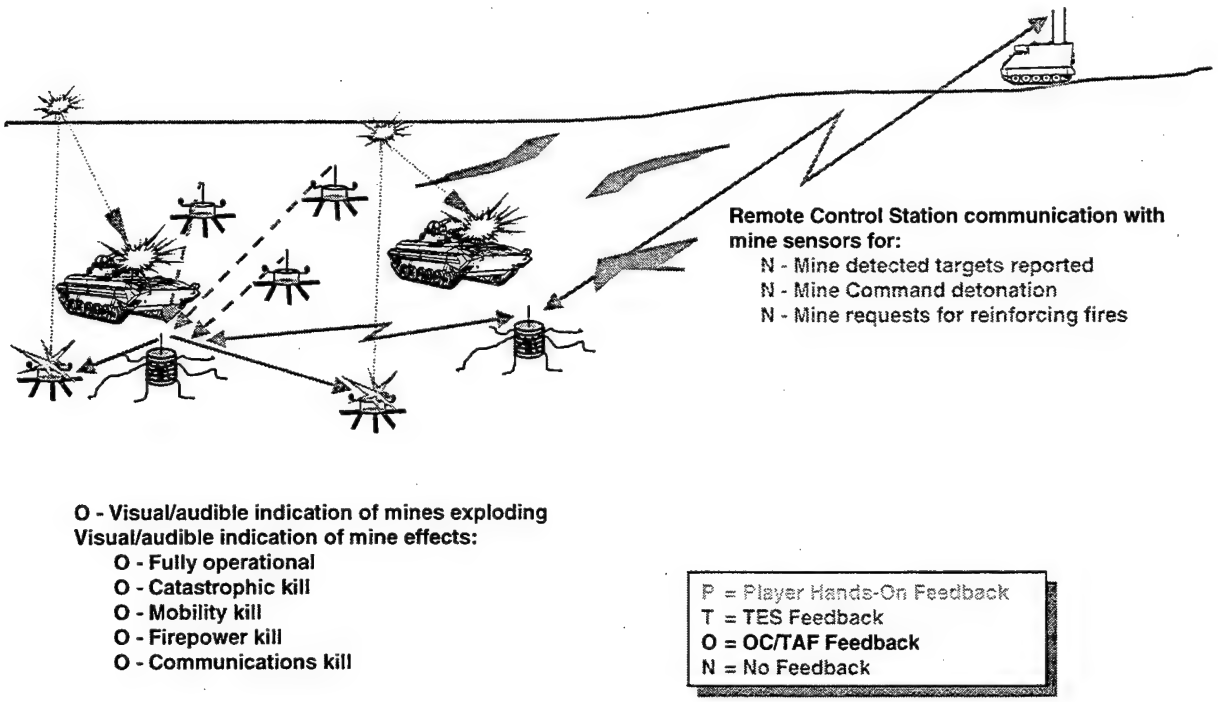


Figure 5. Data elements required to support player intrinsic feedback.

The legend in Figure 5 breaks down the intrinsic feedback requirements by source:

P Actual feedback obtained by the players from hands-on interaction with their tactical equipment or other players

T Simulated feedback provided by the TES

O Simulated feedback provided by OCs and TAF analysts (includes firemarkers)

N No feedback provided

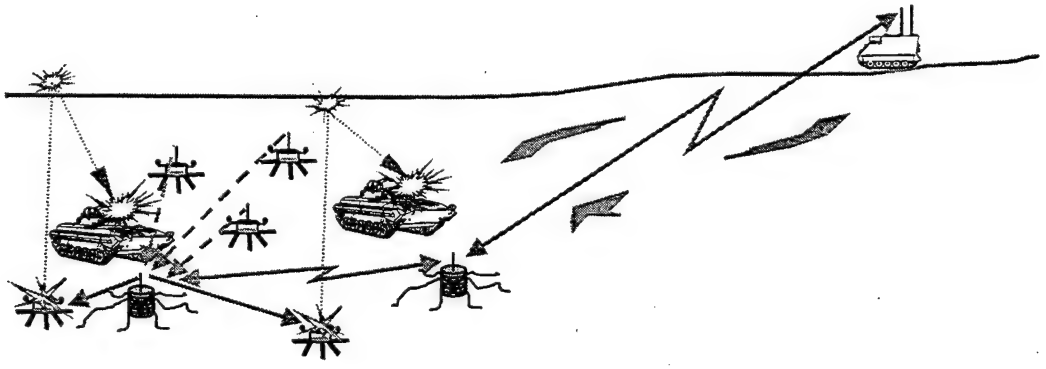
In Figure 5, two BMPs are encroaching upon an area defended by a simulated RAPTOR minefield. To simulate Wide Area Mine (WAM) engagements, TAF analysts and OCs must perform extensive control actions. Below the BMPs is a listing of the "down range" feedback required by the BMP crews as they close on the minefield and WAM engagements disable their vehicle. OCs detonate pyrotechnics to simulate the visual and audible signatures of exploding WAM mines (O). During the Task Force XXI Army Warfighting

Experiment (TF XXI AWE), a TAF analyst input data into a WAM computer actuating the BMP's Combat Vehicle Kill Indicator (CVKI) light (O). A continuously blinking CVKI light cued the crew that their vehicle was disabled--catastrophic, mobility, firepower or communications kill. Neither OCs, TAF analysts nor the TES can provide the RAPTOR Remote Control Station (RCS) operator intrinsic feedback from minefield sensors. There is no capability to simulate minefield sensor transmissions to the RCS operator for targets detected or reinforcing fires (N). There is no capability to simulate the RCS operator's capability to command detonate all or part of the minefield (N).

Figure 6 lists OC and TAF analyst control and feedback (CAF) functions required to generate intrinsic feedback for the O-coded items in Figure 5.

TAF Analyst

1. **Receive mine location information from OC**
2. **Assign a number to each mine and enter mine locations into WAM computer**
3. **As vehicles approach mines inform OC**
4. **Record instrumented battle damage and OC manual assessments as required**



OC

1. **Monitor emplacement of minefield and record grid location of each mine and inform TAF analyst**
2. **When notified by TAF that vehicle is approaching mine, mark engagement with signal flare and grenade simulator**
3. **Manually assess minefield effects during breaching operations**

Figure 6. OC and TAF analysts CAF functions.

To simulate RAPTOR engagements, OCs and TAF analysts perform extensive coordination before the engagement event. The OC monitors BLUFOR emplacement of the minefield and records the grid location of each mine. The OC provides the location of the individual mines to the TAF analyst. The TAF analyst plots the location of each mine in the WAM

computer and enters a 100-meter attack radius around each mine location. During mission execution, the TAF analyst monitors vehicles approaching the minefield. If a vehicle enters the 100-meter attack radius of an emplaced mine, the WAM computer assesses battle damage against vehicle through the IS. Concurrently, the TAF analyst notifies the OC to mark the WAM engagement. The OC shoots a flare into the air with a pyrotechnic pistol to simulate WAM air-bursting munitions then throws a grenade simulator to simulate the top-down attack against the BMP. The OC manually makes all battle damage assessments (BDAs) for breaching operations. Neither SAWE nor the WAM computer can simulate a breach/lane in a minefield. Both TES systems will kill all exercise players encroaching on the minefield. The simulated minefield is either on or off. There is no capability for TAF analysts to designate a breached lane through the minefield so that vehicles can move through the lane unharmed. Consequently, OCs manually adjudicate minefield BDA during breaching operations.

A Three-pronged Approach for Using Automation to Address Growing Trainer Workloads and Feedback Gaps

ATSC asked ARI to take a three-pronged approach to defining automation tools that can help trainers in the live domain address the increases in workload associated with force modernization. The goal of the Cognitive Requirements for Information Operations Training (CRIOT) Study was to define workstations that help trainers perform exercise control and feedback functions for digitized units (Brown, Anderson, Begley II, and Meliza, in preparation). The Advanced AAR Media (A3RM) Study focused on identifying and addressing shortfalls in the ability to prepare AARs (Brown, Anderson, Begley II, and Meliza, in preparation). The current study, called Advanced TES Concepts (ATESC), focused on functions performed by trainers to control exercises and to collect data for feedback relative to the employment of weapon systems and RSTA systems. The goal the ATESC study was to identify high priority requirements for future TES systems. In addition to correcting expected problems performing CAF functions, ATSC was concerned with providing a vision of an integrated system for simulating weapon and RSTA systems.

The Army currently uses unwieldy stovepipe TES systems to simulate direct-fire, indirect-fire and area weapons. Fielding of emerging weapon systems will provide individual

soldiers the capabilities to engage area targets as well as point targets. Armored crews will have the capability to engage point targets with a line-of-sight (LOS) and a non-line-of-sight (NLOS) capability. This creates an awkward situation in which individual soldiers and individual platforms rely on at least two separate, unintegrated systems to support the simulation of their weapons. New and emerging non-lethal weapons raise the possibility of at least a third, unintegrated system being added to support the simulation of weapons.

Simulation of weapons effects is also becoming more complex with the increased use of smart weapons. For example, a laser-guided bomb requires laser designation be included in the weapons simulation process.

In addition to helping trainers address increased workloads and gaps in feedback, the ATESC Study was also intended to help integrate the simulation of direct-fire, indirect-fire and non-lethal weapons. ATESC was also intended to support the stimulation of target acquisition systems. For example, during force-on-force exercises the Firefinder counterfire radar requires input for indirect-fire trajectories to stimulate the radar.

Overview of ATESC Study Methodology

We conducted the ATESC Study in three phases. In Phase I we updated and refined the TAAF Aids analysis. The outcome was a more up to date and accurate description of the functions OCs and analysts would have to perform to support feedback for the new and emerging systems, in the absence of improvements in TES or IS systems. This action also provided us with an improved listing of the gaps in feedback that would exist, in the absence of TES or IS improvements.

In Phase II we developed an online database for use in comparing the benefits gained by concepts for future TES systems and IS. we identified high-payoff intrinsic and extrinsic feedback requirements for existing and emerging tactical systems. During Phase III, we developed high-level TES concepts to provide the needed feedback and identified how each concept reduces OC and TAF analyst workload and eliminates data deficiencies. We also identified battlefield operating systems (BOSs) and the weapon and acquisition systems supported by each concept.

Phase I: Refining Lists of Trainer Functions and Feedback Gaps

Overview

During Phase I of the study, we updated our TAAF Aids analysis of intrinsic and extrinsic feedback requirements based on interviews with NTC OCs and TAF analysts. The objective of the NTC interviews was to obtain Force XXI AWE lessons-learned on control and feedback requirements for emerging tactical systems. Force XXI included a portion of the operational systems addressed by the TAAF Aids study. During the AWE, NTC employed prototype TES systems to automate AH-64D Longbow HELLFIRE NLOS engagements and battle damage inflicted by the Hornet WAM minefield. The appendix also describes the extensive control and feedback actions OCs and TAF analysts perform to simulate existing systems and prepare AARs.

We based the TAAF Aids analysis on the 1996 Army Science and Technology Master Plan (ASTMP) and related TRADOC ATSC references to upgrade the TAAF Aids analysis. As part of the current effort we reviewed the ASTMPs for 1997 (Department of the Army, 1997) and 1998 (Department of the Army, 1998b). As we researched force modernization initiatives in these more recent references, we reconciled the feedback requirements of each tactical system with our TAAF Aids findings.

During the TAAF Aids Study, as we analyzed the intrinsic and extrinsic feedback requirements of weapon and RSTA systems, we found our analysis of selected systems was applicable to other systems. When our analysis of one system supported the control and feedback requirements of other tactical systems, we designated one of the analyzed systems as a "representative system." For example, the control and feedback requirements for the Stinger missile are addressed by a representative system--the Avenger. When we could not extend the analysis of one tactical system to other similar systems, we designated the system a "special case." For example, we found that there was no representative system for the Combustion Engine Defeat Mechanism. This non-lethal system has a unique set of intrinsic and extrinsic feedback requirements. In the current study, when we found a new system not addressed in the TAAF Aids analysis, we analyzed the employment of the system and its control and feedback requirements.

Depending on the results of the analysis, we listed the tactical system under a representative system in the TAAF Aids analysis, designated the system as a new representative system or treated the initiative as a unique system. See Appendix B for a listing of sources of information about future systems, and see Appendix C for all weapon and RSTA systems analyzed during the TAAF Aids and ATESC Studies.

When we contrasted feedback requirements for existing and emerging weapon and RSTA systems with the capabilities of current TES and IS, the feedback fell into four categories:

-- Feedback generated by player interaction with tactical equipment and other players.

-- Feedback provided by the TES and IS.

-- Feedback produced by trainer (OC or TAF analyst) control actions and data collection

-- Unattainable feedback.

To determine high priority feedback requirements, we focused on trainer-provided and unattainable feedback since:

-- Trainer CAF functions for force modernization initiatives have the potential to overwhelm trainers and jeopardize their capability to observe, mentor and perform training analysis (Brown et al., 1998).

-- Unattainable feedback creates situations in which CTCs and homestations may be unable to simulate a tactical system or provide post-exercise feedback on the employment of the system. Our interviews with CTC OCs revealed that this is already a problem. CTCs are unable to simulate the Claymore Mine, the MK19 40mm Grenade Machine Gun and Hydra 70 rocket.

NTC OC and TAF Comments on Control and Feedback During TF XXI AWE

This section discusses significant findings from our interviews with NTC OCs and TAF analysts on control and

feedback tasks performed during the TF XXI AWE for weapon and RSTA systems.

(1) Pairing of shooter to victim. OC's stated there is usually no pairing of shooter to victim by the Core Instrumentation System (CIS) for MILES engagements. Consequently, OCs must check the kill code for each disabled vehicle to determine what type of combat system killed the vehicle. OPFOR does the same for their vehicles. OCs use the kill codes to prepare killer/victim statistical charts for the AAR. Data is available to support exact pairings--bumper number to bumper number--using MILES II Player Identifications (PIDs). Using a ruler and a list of PIDs, a person can pair the victim PID to the killer PID. This is too time consuming so the OCs do not perform this reconciliation. TAF workstations display a vector between the shooter and the victim, however, the system detects only 30 percent of the pairings that actually occurred.

(2) AH-64D engagements. During the AWE, the NTC IS supported automatic AH-64D Hellfire Longbow missile engagements with direct interfaces to the aircraft. To reduce latency problems, NTC provided a dedicated channel to support Longbow engagements. The technology used to automate the engagements was referred to as "geometric pairing." The AH-64D Fire Control Radar sent pilot target selections to the CIS to produce the Longbow Hellfire footprint. The Pilot's trigger pull was also transmitted and the CIS performed battle damage assessments automatically. GPS accuracy (off by 100 meters sometimes) and synchronization of clock time between the engaging aircraft and the CIS were problems. NTC also experienced latency problems--45 second latency in the assessment of effects. If the CIS was not tracking the Vehicle Detection Device (VDD) of the target vehicle(s) there was no automated assessment. NTC discovered two vehicles close together could be killed by a single missile, which is an inaccurate simulation of Longbow Hellfire capabilities. The average number of Hellfire Longbow missiles fired during an engagement was four to five missiles. OCs cautioned that geometric pairing supports Longbow Hellfire engagements but is not a good simulation of Hellfire or Hellfire II LOS or NLOS engagements since the geometric pairing TES does not monitor laser tracking procedures. For direct-fire Hellfire and Hellfire II, a laser in the nose of the aircraft provides a MILES capability for LOS

engagements. The laser transmits hit words to the target during the last 12 seconds of the trigger pull. The pilot must maintain the lase on the target for the entire 12 seconds to achieve a kill. There is a separate laser for the 30mm gun. There is not a TES for Hydra rockets.

(3) Emerging helicopter engagement system. A new system, Combined Helicopter Operations in a Combat Environment (CHOICE) under development by Intercoastal Electronics, will correct the deficiencies of geometric pairing. CHOICE is a RF system. The aircraft SMart On-Board Data Interface Module (SMODIM) senses where the aircraft and targets are. The SMODIM sends a RF signal to the target vehicle receiver (TOTEM) that in turn assesses battle damage. A TOTEM must be installed on every player vehicle for CHOICE to work. With CHOICE, the target and the firer are on a common grid eliminating position location error.

(4) SAWE limitations and control actions. OCs perform intensive control actions to simulate battlefield effects and casualties/battle damage for conventional minefields. SAWE cannot simulate a breach/lane in a minefield and will kill all players encroaching on the minefield. The SAWE simulated minefield is either on or off. SAWE operators cannot designate a lane in the minefield that BLUFOR or OPFOR has effectively breached so that vehicles can move through the breach unharmed. To preclude this problem, OCs manually adjudicate most minefields rather than use SAWE.

(5) Mine Effects Simulator (MES). The MES simulates magnetic and seismic activation. MES senses motion at a range of eight meters and magnetic flux at two meters and sends a signal to vehicle MES receivers to assesses mobility kills for vehicles entering the minefield. A voice message (MILES Betty) informs the crew through the vehicle intercom that they have incurred a mobility kill inflicted by a minefield. However, there is no visual signature to simulate the exploding mine. Engineer OCs stated that BLUFOR use of MES to simulate minefields still required manual adjudication, since MES did not accurately simulate BLUFOR mines. BLUFOR conventional mines are detonated by pressure or contact with a tilt-rod. To activate the mine, the vehicle must pass directly over the mine. Consequently, OCs must manually resurrect OPFOR vehicles which were killed in close proximity to the

BLUFOR-emplaced MES mine but that did not pass directly over the mine. NTC has 19,000 MES mines.

(6) Wide Area Munition (WAM) simulation. During the AWE, NTC used a WAM computer in the TAF. OCs sent each WAM location to the TAF, and the TAF assigned the WAM a number and inscribed a 100-meter circle around each mine to represent the radius of damage. The WAM computer signaled the IS to disable vehicles entering the kill zone of each WAM using a Pk for each vehicle type. The TAF told the engineers when a unit vehicle approached the WAM. If the vehicle entered the 100-meter circle around the WAM, the engineer shot a flare into the air to simulate the upward launch of the WAM munition, while the WAM computer and CIS assessed combat damage. If the VDD of the target vehicle was inoperable, the OC performed the assessment using his control gun. OCs stated that the WAM Pk was not high enough to realistically simulate the mine's capability. RAPTOR capabilities such as selective command detonation of mines, transmission of vehicle detections to the TOC and RAPTOR calls for reinforcing indirect-fires were not played during the TF XXI AWE.

(7) TES reliability. OCs spend considerable time checking player TES for proper operation. OCs will not permit a vehicle with non-operational MILES to participate in a force-on-force exercise. Co/Tms typically lose two or three vehicles before the battle begins for non-operational MILES. OCs attribute problems with MILES to the constant rotation of the equipment between the BLUE and GOLD vehicle fleets in the draw yard. There are not enough MILES to permanently install on each vehicle. In contrast, the OPFOR has dedicated MILES for each vehicle and much more reliable TES performance.

(8) Player Detection Devices (PDDs). Dismounted players do not wear PDDs. To track the location of dismounted platoons in the TAF, light platoon OCs wear the PDD. Like JRTC, NTC does not require dismounted players to wear PDDs because of the excessive weight of the device (16 pounds). As a result, all dismounted player personnel are non-instrumented, requiring manual adjudication for SAWE-simulated engagements--chemical strikes, artillery/ mortar fires and minefields.

(9) Radar Simulation System (RSS). NTC uses the RSS to stimulate Q36 Firefinder Radars with artificial projectile

trajectories. The RSS operator is located in the Fire Support TAF. When OPFOR fires an artillery mission, a TAF analyst passes the mission to the RSS operator. The RSS operator queries the Q-36 and receives the radar's location, altitude, orientation, zone, cueing status, etc. If the radar meets all parameters to acquire the projectiles, the operator enters the point of origin and impact grid for the rounds into the RSS and transmits the information to stimulate the Q-36. At the Q-36, an alarm alerts the crew and the radar provides the locations of the firer and impacting ordnance. In addition to providing stimulus for one BLUFOR Q36 radar, the Fire Support TAF role-plays one division artillery Q37 Firefinder Radar and provides targeting information to the field artillery battalion TOC.

(10) Platoon AARs. Platoon OCs must complete their AARs within 1.5 hours after change of mission (COM). Generally, AAR products produced in the TAF do not get to the platoon in time for the AAR. Platoon OCs use butcher paper charts, dry-erase board, toy vehicles, hastily prepared terrain models and pre-made poster-board charts to support their AARs.

(11) Marking Air Defense Artillery (ADA) fires. A white star cluster launched in the vicinity of the firing ADA unit simulates the firing of Avenger, Line Backer and Stinger missiles. When the ADA firer pulls the trigger, he fires an Armored Tank Weapon Effect Signature Simulator (ATWESS) charge. When the OC sees the ATWESS signature, he fires the white star cluster to provide a more realistic signature.

(12) Adjudication of ADA engagements. Bn TF OCs manually adjudicate air-to-ground, fixed-wing engagements. For ground-to-air, fixed-wing engagements, the NTC Division Tactical Operation Center (DTOC) and the Air Force OCs manually adjudicate engagement results based on reports from Bn TF OCs and ground-based Air Force OCs. MILES supports rotary-wing ground-to-air and air-to-ground engagements and produces a TES pairing. An IS-reported pairing may or may not occur. The IS currently pairs shooter to victim for only 30 percent of the MILES engagements. The kill light on the helicopter is a strobe light on the lower part of the fuselage. The light is difficult to see. OCs often call the TAF to determine if the aircraft was killed. Range for the Stinger is 5

kilometers (KM). Maximum range for Stinger MILES is 3.7 to 4 KM. There are no MILES sensors on the lower portion of the helicopter's nose, rear or belly of the fuselage. OCs say the location of the MILES sensors on the aircraft combined with the reduced range for Stinger MILES does not provide a good simulation of ADA systems.

(13) Stinger MILES. Stinger MILES is fragile and breaks after about four days in the box (exercise area). If a Stinger team has broken MILES, the team can participate in fixed-wing engagements only. Identification Friend or Foe (IFF) attaches to the grip stock of the actual Stinger. For the MILES Stinger there is no IFF query capability, so OCs cannot determine if the Stinger firer queried the aircraft before the engagement. OCs can only check to see if the Stinger team programmed the IFF correctly. Aircraft response to IFF queries (squawks) are not picked up by the instrumentation system.

(14) Shortage of ADA OCs. There is not enough ADA OCs to cover all Avenger/Line Backer platoon engagements and Stinger platoon (10 teams) engagements. OCs say they can view only 50 percent of the BLUFOR ADA assets at any given time. With augmentees, the ADA OCs can improve their coverage of the ADA battery. Co Tm OCs "help cover down" on ADA assets in their area that have no counterpart ADA OC. There is no dedicated ADA TAF analyst. Usually, a Co Tm analyst supports ADA data collection as a secondary role. The analyst monitors the Co Tm and ADA control nets. The Brigade TAF has no ADA analyst.

(15) ADA AARs. ADA platoon OCs conduct AARs after each exercise. The Bn TF TAF provides top-down views of computer-generated graphics (referred to as RGBs) depicting ADA locations, enemy air avenues of approach, and tracks of actual OPFOR flight routes. The ADA OCs inform the TAF analyst of aircraft ingress and egress routes and the analyst prepares a RGB to support platoon AARs. ADA assets retained at Brigade level have no TAF counter part to prepare AAR products. There are ADA battery AARs at the middle and end of the unit's rotation. Senior Bn TF and Brigade OCs address the ADA battlefield operating system (BOS) during Bn and Brigade AARs.

(16) Logistics OC control duties. S-1/S-4 OCs said their control duties contributed to their observation and mentoring duties. For example, while an OC is performing

control duties to ensure that the unit has the correct tools, maintenance manuals, parts and mechanics to repair a disabled vehicle, the OC is also observing and mentoring his BLUFOR counterpart(s). During our TAAF Aids visit to JRTC, logistics OCs made similar comments about control duties complementing--rather than distracting--from their observation and mentoring duties.

(17) OC digital communications. Logistics OCs said they needed a wireless burst or FAX capability to send the TAF standardized Excel and PowerPoint reports. Currently, the OCs use the Observer/Controller Communications System (OCCS) voice radio to transmit unit supply and equipment status by line number, which is time consuming and ties up the OC control net. Currently, Logistic OCs maintain information on BLUFOR personnel, supply, and maintenance status by making date-time-group entries in green notebooks. The Aviation Logistics OC uses a personal 386 laptop computer to prepare his reports and hand carries electronic disks to the TAF for the AAR. However, all stated that laptops and floppy disks did not work well in the desert. The Aviation OC proposed a keyboardless system that the user operated with a stylist and touch-sensitive screen, similar to systems used by UPS/FEDEX. He envisioned a number of function keys that the OC could use to call-up various templates. He also proposed an OC e-mail capability.

(18) Brigade and Bn TF AAR products. For the Bn TF AAR, the TAF produces well over 100 AAR products. For the Brigade AAR, the Brigade TAF produces 45-60 AAR products. The Engineer TAF produces about 85 AAR aids and trims the total to 45-65 for the engineer support slice AAR presentation. The Fire Support TAF produces 25-50 products for the AAR. TAF personnel stated that fewer AAR products resulted in better AAR discussions. The AAR products consist of Solaris still and animated computer-generated graphics, overhead slides, and PowerPoint slides. All AAR products are included in the unit's take home package regardless of whether or not the products were shown during the AAR.

(19) Standardized AAR products. TAF analysts stated they maintained cookbooks containing mandatory and optional sample displays for presentation during the AAR. For the Bn TF AAR there were 10-12 mandatory slides. OCs often informed their TAF integrator of the AAR products needed by

referring to a slide number in the AAR cook book. The Engineer TAF said they had 280 slides in their cookbook. TAF analysts prepare printed RGBs (snapshots) to support company and platoon AARs. However, the OC must leave the field and come to the TAF to pick-up the slides.

Implications of Emerging Weapons on TES/IS

Our analysis of ASTMP force modernization initiatives during the TAAF Aids and CAF Studies revealed trends in weapon capabilities that present major implications for the new generation of TES/IS.

(1) Line of Sight (LOS) Weapons

Improved acquisition and engagement ranges for emerging direct-fire systems will exceed the simulation capabilities of MILES laser technology. For example, smoke and dust degrades the effectiveness of the MILES eye-safe laser. The gunner of a direct-fire platform may thermally acquire an OPFOR combat vehicle through smoke at an extended range, but he will be unable to engage the target at the weapon's maximum effective range due to MILES limitations.

There are MILES and TES/IS limitations that impact on the simulation of today's direct-fire systems that will continue to impact on future direct-fire weapon systems. MILES lasers will not penetrate minor obstructions. Tree leaves will obstruct the MILES laser. Firing positions with berms ("MILES berms") that are inadequate to stop penetration by real ordnance will stop a MILES laser beam. For safety, CTC rules of engagement preclude engagements by dismounted soldiers at less than 10 meters. OCs perform exercise control using their laser pistols (control guns) to manually adjudicate close-in engagements and outcomes of MILES engagements altered by minor obstructions.

IS data collection does not reliably pair the direct-fire shooter to the victim for the purposes of extrinsic feedback. TAF workstations are capable of displaying a direct-fire vector between the shooter and the victim; however, the NTC IS detects only 30 percent of the pairings that actually occurred. Our visits to CMTC and JRTC during

the TAAF Aids Study revealed a similar problem. The IS is unable to pair the impact location of rounds that missed the target to the shooter that fired the round. These two pairings--shooter to victim and shooter to misses--are extrinsic data needed by trainers to provide post-exercise feedback on how well the units controlled direct-fires in the engagement area or during the assault of the objective.

Hit avoidance is a force modernization initiative that will provide combat platforms an active defense against the top-down or horizontal attack of smart weapons. Sensors on the platform will detect acquisition by precision ordnance and will use jammers, obscurants, false target generators and counterfire to reduce the hit probability of the incoming projectile. Today's TES and IS does not have the capability to selectively dial down the Pk for combat platforms that employ active protection measures against precision munitions.

(2) Non-Line-of Sight (NLOS) Weapons

Force modernization is creating a situation in which NLOS engagements are not restricted to field artillery and mortars. Emerging weapons and munitions will provide a NLOS capability that permeates the battlefield extending to the individual soldier equipped with the Objective Individual Combat Weapon (OICW). You will recall that indirect-fire engagements using SAWE/MILES II require intensive exercise control actions to provide intrinsic feedback to exercise players (Figure 3). Acquiring additional OCs, TAF analysts and firemarkers to perform these control procedures for every emerging NLOS system is not a feasible alternative.

Current and future precision-guided, smart, intelligent and brilliant NLOS munitions have a major impact on the future generation TES/IS. Current SAWE battle-damage-assessment algorithms do not account for the capability of these munitions to semi-autonomously or autonomously seek and destroy targets with the equivalent accuracy of direct-fire systems. Further, OC and TAF analyst control actions to simulate these precision munitions are far more complicated than for conventional indirect-fire projectiles that travel along ballistic trajectories with no terminal guidance or detection capability. Currently, simulation of precision-guided

munitions such as Copperhead are the exception rather than the rule during artillery engagements at the CTCs. When a BLUFOR unit executes a Copperhead mission, five geographically separated control personnel are required to simulate a single engagement. In the future, employment of terminally guided, smart ordnance will be prevalent during artillery, mortar and attack helicopter NLOS engagements. Trainers will be unable to keep up with the OPTEMPO of the battle using manual control procedures. The result--the simulation will have no credibility.

(3) Area Weapon Effects

Today, OCs and TAF analysts perform intensive control actions to simulate the effects of manually and dynamically emplaced minefields and breaching operations. However, it is unfeasible to employ manual control procedures to simulate the capabilities of emerging mines and minefield C2 systems. For example, the Intelligent Minefield, which employs the top-down-attack WAM, also referred to as Hornet, will have a surveillance, reporting and self-defense capability. The minefield will detect and report vehicles approaching the minefield, detonate by self-activation or on command, and request reinforcing fires. A remote C2 station provides a capability to detonate the whole minefield or a selected portion(s) of the minefield. Today, a TAF analyst enters the minefield's location and technical data provided by the OC into the SAWE control station. SAWE compares the location of the player entities to the geographic area affected by the minefield and electronically assesses mobility kills to vehicles entering the minefield. SAWE cannot simulate the reduced effectiveness of the minefield as vehicles encroach on the obstacle, mines detonate and minefield attrition occurs. SAWE cannot simulate lanes created in the obstacle by mine plows, mine rollers, the Mine Clearing Line Charge (MICLIC) or other breaching equipment. During breaching operations, the TAF analyst turns-off SAWE and OCs manually adjudicate minefield effects against the breach force using control/laser pistols. The Mine Effects Simulator (MES) overcomes the SAWE limitations discussed, but causes other problems requiring OC adjudication (see preceding section containing NTC OC comments). Creating new control procedures and assigning additional manning to simulate the diverse capabilities of the Intelligent Minefield are not feasible alternatives.

Future Nuclear, Biological and Chemical (NBC) detection systems will provide an increased stand-off capability to warn units of NBC strikes. These new detection systems will require stimulation by the future IS/TES to activate detector alarms which, in turn feed, digital C2 systems that predict the area affected by the hazard and disseminate the warning. Today, SAWE can simulate a chemical strike with extensive support from trainers; however, SAWE cannot simulate a biological or nuclear strike. To simulate a chemical strike, the TAF analyst enters the target area provided by OPFOR into SAWE. If the strike is a non-persistent agent, SAWE simulates the drift and dissipation of the chemical cloud based on the wind direction and speed provided by an OC in the exercise area. Based on targeting information provided by the TAF, OCs mark the chemical strike with pyrotechnics and CS (tear gas) grenades. SAWE also activates M8 chemical detection alarms in the affected area to simulate the presence of a chemical agent. OCs manually adjudicate casualties inflicted by the chemical strike since players do not wear PDDs that interface with the instrumentation system. (The 16-pound PDD vest is too heavy and cumbersome for the dismounted soldier to wear and still carry his weapon, ammunition and individual equipment.) If the chemical is a persistent agent, the contaminated area may remain effective for days. Again, OCs manually adjudicate casualties by evaluating BLUFOR protective actions and the thoroughness of unit decontamination procedures. The development and fielding of the Lightweight PDD (LW PDD) has the potential to dramatically reduce OC workload and distraction from observation duties. The LW PDD will interface with the IS and automate the assessment of chemical, indirect-fire and mine effects on dismounted soldiers. The LW PDD will also enable the IS to track and display each soldier's location and status. This capability will greatly reduce the number of OC reports rendered to the TAF to update the evolving ground truth situation during dismounted operations and will enhance the credibility of feedback provided during the AAR.

The future capability of multi-spectral obscurants will impact on TES and IS. Emerging multi-spectral obscurants will screen the activities and dispositions of friendly units and defeat enemy precision-guided ordnance and RSTA capabilities. Currently, the CTCs use smoke generators, fog oil and smoke pots to simulate artillery

and mortar smoke and generator-produced smoke. The smoke defeats visual and optical surveillance, but does not defeat thermal sights or radar acquisitions or block target acquisition lock by smart ordnance with a seek-and-destroy capability. Manual control procedures are not a feasible alternative to simulate the effects of multi-spectral smoke. Sophisticated enhancements to area weapon effects simulation are required to degrade the Pk of smart ordnance entering a target area obscured by multi-spectral smoke.

(4) Non-Lethal Weapons

Operations other than war are becoming more frequent, more complex, and politically charged. These new missions bring an increased use of non-lethal weapons such as the Aqueous Foam Barrier and the 12 Gauge Bean Bag round. Current TES systems do not support these new weapon systems. Non-lethals pose special challenges for the realism of training. For example, MILES players exist in one of two states. They are either "on" or "off." If a player's MILES sensor receives laser energy, a loud audible alarm goes off. If the player receives a direct hit, he must inactivate his laser transmitter to silence the alarm. This player is now "out-of-action." For intrinsic feedback on the wounds he sustained, the player must take out a casualty card to identify the extent of his wounds. This type of "on" or "off" feedback is sufficient when dealing with deadly weapons, but in the non-lethal arena, there are many different levels of effects that are possible. For example, a soldier may engage an antagonist with a 12 Gauge Bean Bag round. The antagonist will be disabled initially, but he will recover and either leave the area or rejoin his fellow antagonists in the confrontation.

The Bn TF does not control intelligence and electronic warfare (IEW) units that intercept, locate and disrupt the enemy's tactical information system. These assets are available at Brigade and higher echelons. However, the Bn TF is subject to OPFOR IEW and OCs and TAF analysts must evaluate BLUFOR countermeasures to overcome the effects of jamming. During force-on-force simulations, exercise players employ actual IEW equipment to locate and jam enemy command posts. Players receive intrinsic feedback from hands-on operation of their C2 and IEW systems and require no support from exercise controllers or the IS/TES. However, extrinsic feedback information needed by OCs and

TAF analysts to support AARs and coach BLUFOR on electronic attack countermeasures is not readily available.

Currently, OCs and TAF analysts monitor BLUFOR voice communications, observe player actions, and conduct cross-talk on exercise control nets to determine the impact of OPFOR jamming on BLUFOR operations. The advent of digital communications presents a new set of problems. OCs and analysts have no means to eavesdrop on digital communications to determine the impact of OPFOR jamming on BLUFOR digitized C2. The CTC Army Battle Command System (ABCS) initiative will integrate ATCCS to include the FBCB2 into the IS (Department of the Army, 1998). However, equipping trainers with BLUFOR digital systems is not sufficient. Trainers need an automated capability to identify which digital nets were jammed, the time periods for the jamming, message flow before the jamming began and after the jamming stopped, and types and numbers of messages disrupted by the jamming. If the IS has the capability to eavesdrop on digital nets, all of this information is obtainable except for the type and number of messages disrupted by the jamming. However, if the IS could eavesdrop on digital traffic flowing across the local area network (LAN) in the Bn TF tactical operation center (TOC), the IS could provide objective data on the impact of OPFOR jamming. For example, if the Bn S2 transmitted an enemy overlay and all nodes in the TOC received the overlay at 1500 hours and all nodes outside the TOC received the overlay at 1800 hours, this would indicate that OPFOR effectively disrupted BLUFOR digitized command and control for three hours--less the transmission time for the overlay.

Implications of Emerging RSTA Systems on TES/IS

Our analysis of ASTMP force modernization initiatives during the TAAF Aids and CAF Studies revealed trends in RSTA system capabilities that present major implications for the new generation of TES/IS. RSTA systems currently provide an over-the-hill capability to determine the disposition of individual enemy vehicles and soldiers. RSTA line-of-sight systems at every echelon will have greater detection ranges for ground and air threats. Fire control systems will be equipped with digital command and control (C2) and detection systems that permit the crew of the weapon platform to discern friend from foe. Digital C2

systems will link sensor to shooter providing near-real-time detection and attack of threat ground and air threats.

During force-on-force simulations, exercise players employ actual RSTA equipment to acquire their opponents. With the exception of the Firefinder counterfire radar, players receive intrinsic feedback from hands-on operation of their RSTA equipment and require no support from exercise controllers or the IS/TES. For the Firefinder radar, OCs and TAF analysts perform extensive control procedures to stimulate the radar and to cue the crew in the targeting of OPFOR artillery. See earlier section addressing NTC OC and TAF comments on control and feedback during the TF XXI AWE.

Although players receive intrinsic feedback from most RSTA operations by interaction with actual equipment and other players, extrinsic feedback to support future AARs and coaching on the employment of RSTA systems will be a problem. For example, the Unmanned Aerial Vehicle (UAV) Ground Control Station (GCS) operator views real-time imagery and passes UAV video and reports to the Bn S2. Nothing is simulated. Exercise players perform all tasks interfacing with actual equipment and other exercise players. However, TAF analysts and OCs must perform manual data collection to determine how well BLUFOR employed the UAV to acquire OPFOR dispositions and ascertain enemy activities. The OC questions BLUFOR players to determine the planned flight route and search areas for the UAV. The TAF analyst plots the UAV's planned flight path and compares the named areas of interest (NAIs) and target areas of interest (TAIs) in the reconnaissance and surveillance plan to the search areas assigned to the UAV. The analyst and OC then collaborate to determine if the UAV's flight plan meets the commander's critical information requirements. Since there is no TES system for the UAV, OPFOR cannot kill the aircraft. Since the UAV is not instrumented, the TAF analyst cannot track the UAV's actual flight path against the planned route. The analyst cannot view UAV imagery and compare potentially acquirable targets depicted on his ground truth display with those acquired by the UAV. The analyst cannot compare the UAV acquisitions to the dispositions of the threat on the S2's enemy overlay. Without TES/IS enhancements, trainers will not obtain sufficient information from UAV flights to coach and mentor their BLUFOR counterparts. Other RSTA systems have similar extrinsic feedback shortfalls.

The Battle Combat Identification System (BCIS) poses unique challenges for the future TES/IS. The BCIS assists the gunner in determining if the target in his sight is friendly or enemy. When the gunner lases the target, BCIS interrogates the target vehicle with a millimeter wave. If the target vehicle is BCIS equipped, the target vehicle replies to the interrogation and the reply (friendly or unknown) is displayed in the Gunner's sight. Again, the exercise players receive intrinsic feedback from hands-on operation of their RSTA equipment and require no support from exercise controllers or the IS/TES. However, the current IS/TES cannot collect extrinsic data to support the AAR, i.e., replies to BCIS interrogations. This information is critical in investigations and AAR discussions involving fratricide incidents.

Phase II: Identifying Trainer CAF Functions and Gaps in Feedback Providing High Payoff Targets for New TES Concepts

Overview

Using Microsoft Access 97®, we designed an ATESC database to facilitate our analysis of the adverse impact of CAF functions on trainers, identify unattainable feedback and quantify the value of ATESC concepts developed during Phase III of the study. The database provided us the flexibility to experiment with variables and to alter the scoring and weighting methodology. The ATESC database serves as a tool to support further wargaming and experimentation by the customer, subject matter experts or authors of follow-on studies.

Building a CAF Function Database

In our analysis of trainer-provided feedback, we analyzed the functions trainers must perform to provide the needed feedback to exercise players. The objective of the analysis was to determine whether the trainer should continue to provide the feedback or TES/IS enhancements should be explored to provide the feedback. We performed our analysis in three steps.

(1) We analyzed trainer CAF functions and estimated each function's duration, repetition, complexity, and training and personnel requirements. We refer to these estimates collectively as CAF function characteristics.

(2) We estimated the impact of the CAF function on the trainer's capability to observe, analyze, coach and mentor. For example, logistics OCs perform control actions to provide BLUFOR players intrinsic feedback on whether or not the unit successfully repaired vehicles with simulated combat damage. The OCs question BLUFOR personnel on repair procedures and examine the tools, technical manuals and repair parts on site to affect the repairs. If the unit is knowledgeable of the repair procedures and has all required resources on site, the OC resurrects the BLUFOR vehicle after an appropriate period of time. Although the CAF

functions involved to provide this feedback require intensive OC effort, NTC and JRTC logistics OCs informed us that these functions complement rather than detract from their observation and mentoring duties. On the other hand, a CAF function that requires an OC to remain in vicinity of an anti-personnel mine to mark and adjudicate casualties separates him from his BLUFOR counterpart and adversely affects his ability to observe, coach and mentor.

(3) We estimated the potential of the CAF function to overwhelm the trainer. For example, we found that simulation of non-lethal weapons such as the Aqueous Foam Barrier cannot be automatically adjudicated with MILES. Simulation of the Aqueous Foam Barrier will require intensive trainer intervention to simulate the various non-lethal effects of the weapon. If a large number of antagonists approach the barrier, OCs will be overwhelmed with the performance of control functions, which will adversely impact on the credibility of the simulation.

Table 1 lists the variables we considered in assessing the impact of each CAF function on the trainer. The variables helped us identify and prioritize CAF functions that TES/IS enhancements could assume to relieve the burden on trainers. The table depicts the scoring criteria and weights we assigned to each variable. Notice we did not weight function characteristics (variable no. 1). However, we heavily weighted those variables with the potential to distract or overwhelm the trainer (variables no. 2-3). The affect of the scoring and weighting methodology is that variables 1 and 2 are of equal importance, and variable 3 is of highest importance in assessing the adverse impact of the CAF function on the trainer.

Table 1.

Variables Used to Assess Adverse Impact of Specific CAF Functions on Trainers

No.	Variable	Scoring Criteria	Weighting
1	**CAF Function Characteristics**		
	1a. Function completion time	Less than 1 minute = 1 2 - 5 minutes = 2 6 - 10 minutes = 3 11 - 20 minutes = 4 21 - 30 minutes = 5 31 - 60 minutes = 6	
	1b. Number of times function performed by one person during an exercise	1 time = 1 2 - 5 times = 2 6 -10 times = 3 More than 10 times = 4	
	1c. Function complexity	Cognitive = 5 Human computer interface = 4 Human coordination = 3 Navigation = 2 Physical action = 1	
	1d. No. of personnel who perform the function (The CAF functions under analysis are individual functions vice collective functions. This variable addresses the average no. of trainers who perform the function during an exercise. For example: Firemarkers mark the location of impacting ordnance, but there may be 18 firemarkers who perform this function during an exercise.)	1 - 2 persons = 1 3 - 5 persons = 2 6 - 10 persons = 3 More than 10 persons = 4	x1
	1e. Function training requirement	Has required skills = 0 Less than 1 hour = 1 2 - 4 hours = 2 5 - 8 hours = 3 9 - 40 hours = 5 41 - 80 hours = 10 Function Characteristics Total	
2	**Function's potential to distract trainer from observation or analysis duties**	No distraction = 0 Distracted less than 1 minute = 1 Distracted 2 - 5 minutes = 3 Distracted 6 - 10 minutes = 5 Distracted more than 10 minutes = 7	x5
3	**Function's potential to overwhelm trainer**	None = 0 Little = 2 Moderate = 5 High = 10	x5

Using the CAF Function Database to Identify High Priority Targets for New TES Concepts

In this section of the report, we discuss our analysis of OC and TAF analyst CAF functions for weapons and RSTA systems. Again, the objective of the analysis is to identify CAF functions for existing systems and force modernization initiatives that have the potential to overwhelm trainers and jeopardize their ability to observe, mentor and perform training analysis. In our CAF functions analysis, we grouped functions by BOS. We found that some CAF functions support multiple BOSs.

Based on our interviews with NTC OCs and TAF analysts, who supported the TF XXI AWE, we updated CAF requirements contained in the TAAF Aids analysis. Appendix D contains the results of this updated analysis illustrating weapon and RSTA system intrinsic and extrinsic feedback requirements and trainer functions. Figure 7 shows the breakdown of 228 OC and TAF analyst CAF functions among five BOSs. We address the remaining BOSs, C2 and combat service support (CSS) in the CRIOT and A3RM Studies. The pie chart reveals that OCs and TAF analysts are intensely involved in control actions and data collection/entry for the mobility and survivability (MS), fire support (FS), and maneuver (MVR) BOSs. Although most of the intelligence (INT) CAF functions involve gathering data for extrinsic feedback, OCs and analysts perform intrinsic functions to support simulation of the Firefinder counterfire radar. Despite MILES, OCs and TAF analysts have major CAF functions to perform to support the air defense (AD) BOS.

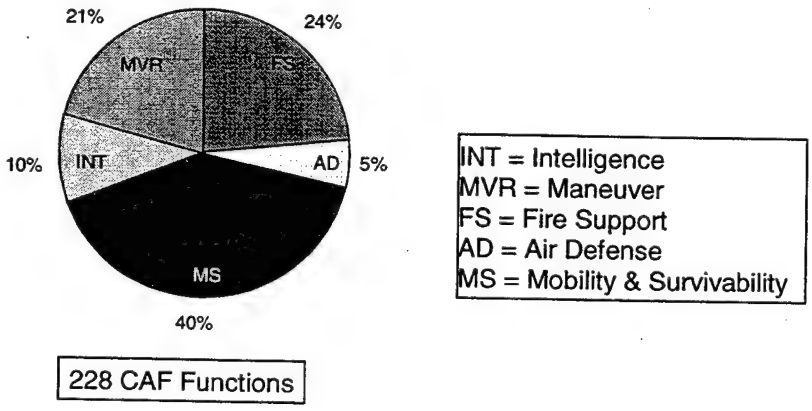


Figure 7. Percent of OC and TAF analyst CAF functions, by battlefield operating system (BOS).

Figure 8 depicts the breakdown of the 228 control and CAF functions among OCs, TAF analysts and firemarkers. Our analysis indicates that the OCs perform the majority of CAF functions.

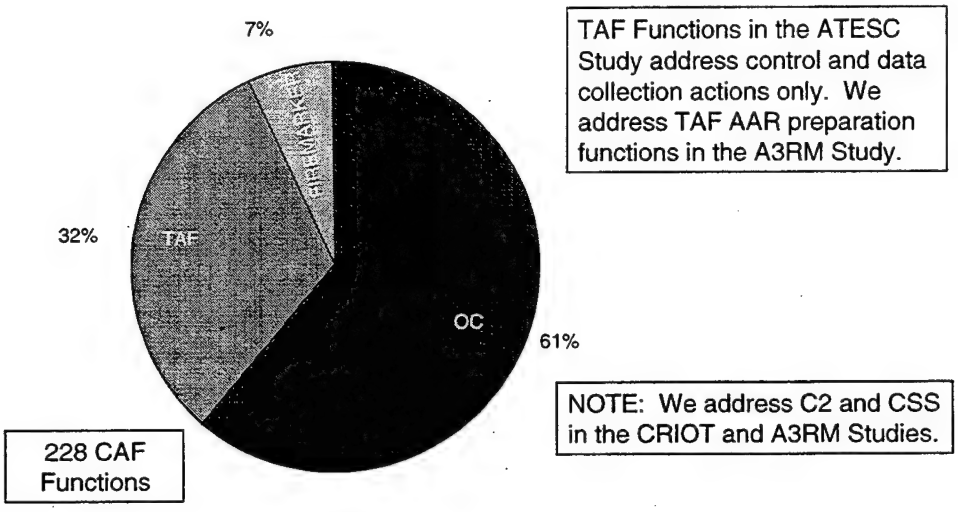


Figure 8. Percent of CAF functions performed by OCs, TAF analysts and firemarkers.

Using the scoring methodology in Table 1, we scored each of the 228 CAF functions for impact on OC and TAF workload. High scores indicate there is a major impact on trainer workload and the ability of the OC or TAF analyst to observe, mentor or perform training analysis. CAF functions with high scores are priority candidates for automation under advanced TES concepts.

The bar graph in Figure 9 depicts by system category the number of CAF functions that scored among the top, middle and bottom one-third of the 228 trainer-provided feedback functions. Figure 9 and subsequent bar graphs arrange BOSs from left to right in descending order--beginning with the BOS with the largest number of high scoring functions.

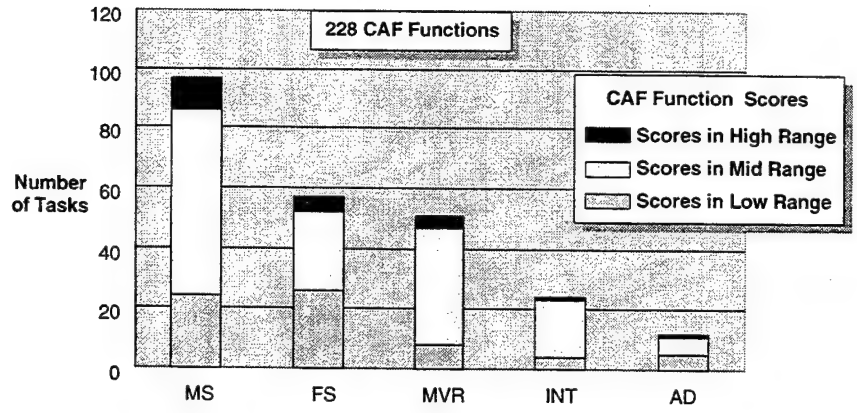


Figure 9. OC and TAF analyst CAF function scores by BOS.

Below are some of the top scoring CAF functions by BOS.

(1) MS

-- Assess victim degree of degradation then use laser control pistol to cue aggressing personnel to irritants or incapacitating effects of the Aqueous Foam Barrier (OC function).

-- Receive and verify obstacle information from OC and enter into TAF workstation (TAF function).

-- Direct TAF to "turn off" SAWE and manually assess minefield effects during breaching operations (OC functions).

-- Receive attack location and agent type from TAF, initiate chemical or biological attack and manually adjudicate casualties (OC Function).

(2) FS

-- If FDC and howitzer crew procedures are valid, notify TAF analyst to fire mission in SAWE (OC function).

-- Enter fire mission into SAWE for assessment of indirect fires (TAF function).

-- Mark fires with air and ground burst simulators as directed by TAF (Firemarker function).

-- Assess call for fire and laser designation procedures (OC function).

(3) MVR

-- Record and report dismounted entity identification (ID), location, firing activity, and status (Combat effective, Out of action and type wounds for wounded in action personnel [WIAs]).

-- Record and report shooter and victim ID for control gun assessments (OC function).

-- Obtain and record kill codes, hit/kill aspect angle and type combat damage for BLUFOR victims (OC function).

-- For Non-lethal Entanglement engagements, resurrect disabled personnel (WIAs) after a prescribed time based on the type net used (OC function).

(4) IN

-- Record and report target types, location, direction, speed, and time detected for all targets located by BLUFOR (OC function).
-- Record and report sensor location, search sector and sensor type for entry into TAF workstation (OC function).

-- Enter OPFOR fire missions into the Radar Simulation System (RSS) to cue the Q36 radar (TAF function).

-- Record and report UAV planned and actual flight routes and search sectors (OC function).

(5) AD

-- Compile total AD engagements from all OCs and provide information to the Division Tactical Operations Center (DTOC) for casualty and battle damage assessments (OC function).

-- Draw vector to show AD engagement of fixed wing aircraft (TAF function).

Building a Database of Feedback Gaps

In our examination of unattainable feedback (feedback that cannot be provided by the current TES/IS or trainer control actions and data collection), we grouped the feedback into four categories.

(1) The intrinsic feedback improves the fidelity of the simulation but is not essential for the simulation of the tactical system(s) and productive force-on-force training. For example, providing the AH-64D Longbow Apache Helicopter pilot a visual indication of a missile trajectory may help him "see" where the missile is going, but is not essential for productive force-on-force training. MILES/Air -to-Ground Engagement System (AGES) II equipment gives the pilot an indication of a kill, hit or near miss through the target vehicle's CVKI light. A continuously blinking CVKI informs the pilot he killed the target vehicle. If the CVKI does not blink, the pilot missed the target vehicle by a narrow-to-large margin.

(2) The intrinsic feedback is essential to the effective simulation of the tactical system(s) and productive force-on-force training. For example, during force-on-force operations a Firefinder radar cannot provide counterfire targeting information on the point of origin of incoming artillery unless the radar receives artificial stimulation to simulate projectile trajectories. Providing the Bradley Fighting Vehicle crew feedback on where direct-fire ordnance is striking the ground for missed shots is unattainable intrinsic feedback that, at first, appears to be nonessential for productive force-on-force training. But this intrinsic feedback is essential. Currently, MILES provides the gunner indications of a kill, hit or near miss from the target vehicles CVKI light. This shows the gunner what happened, but does not provide cues to members of his chain of command that they would receive in combat. Showing the track commander, platoon leader and company commander where missed shots land allows them to assess fire control, distribution and accuracy.

(3) The extrinsic feedback provides data to the trainer that is not essential to assess BLUFOR's performance in employing the tactical system(s). For example, providing the trainer data on an attack helicopter's exhaust gas temperature may be meaningful for individual pilot

training, but has little value in assessing the employment of the helicopter during collective training in a force-on-force simulation.

(4) The extrinsic feedback is essential for the trainer's assessment of BLUFOR's performance in employing the tactical system(s). For example, pairing shooter-to-victim and shooter-to-misses is essential extrinsic post-exercise feedback. Without this information, trainers cannot assess BLUFOR fire control, fire distribution, massing of fires or detect near-fratricide incidents. A RAND study of 330 NTC battles involving 74 companies revealed that Co Tm direct-fire execution did not improve significantly during the course of a 14-day rotation (Hallmark & Crowley, 1997). The inadequacy of feedback on direct-fire hits and misses may be part of the problem. Without this information, trainers cannot effectively assess fire control, fire distribution, massing of fires or detect near-fratricide incidents.

In the paragraphs that follow, we address unattainable intrinsic and extrinsic feedback that is essential to the effective simulation of the tactical system or the trainer's assessment of BLUFOR's performance.

Priority Targets for New TES Concepts Addressing Gaps in Feedback

During the TAAF Aids and CAF Study, we identified intrinsic and extrinsic feedback requirements that could not be satisfied by the TES/IS or trainer control actions/data collection. We refer this feedback shortfall as unattainable feedback. Figure 11 shows the distribution of unattainable feedback elements by BOS. The maneuver BOS has the highest number of unattainable feedback elements.

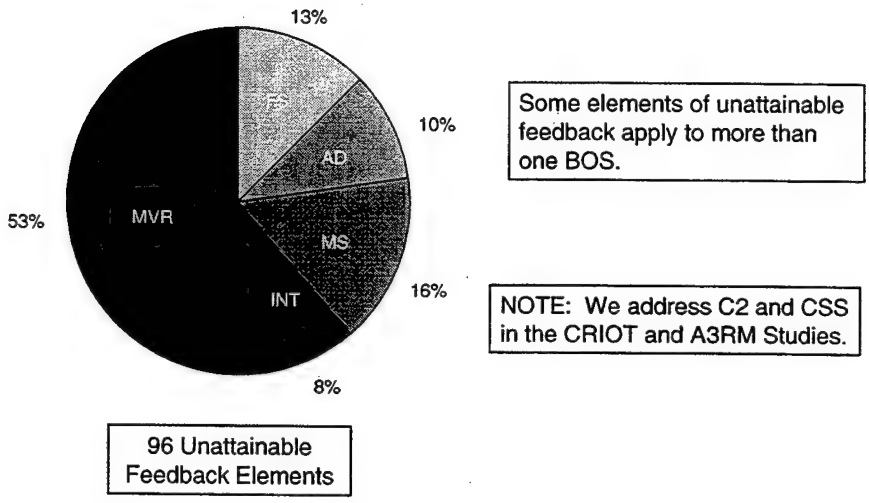


Figure 10. Unattainable feedback by BOS.

Below are some of the unattainable intrinsic and extrinsic feedback elements by BOS.

(1) MVR

-- Location of impacting ordnance other than direct hits for MILES engagements. As discussed earlier, this feedback is required for intrinsic and extrinsic feedback and improves the fidelity of feedback to the exercise players.

-- Vector pairing of shooter to victim for MILES engagements. MILES pairs shooters to victims, but the IS does not receive this data reliably. CAF NTC interviews indicate that the IS captures and displays only 30 percent of the direct-fire pairing vectors. During a CAF in-progress review, we learned that CMTC has a higher percentage of successful shooter to victim pairings. However, CMTC still does not capture 100 percent of the pairings.

-- Victim status-fully operational, catastrophic kill, etc. This is intrinsic feedback needed by the shooter and the victim to simulate the area-fire capabilities of the 40mm Grenade Machine Gun MK-19, Objective Crew Served Weapon, Objective Individual Combat Weapon and other existing and emerging

maneuver area-fire weapon systems. Currently, the CTCs cannot support the simulation of these weapons.

-- Visual indication of ordnance effects. It is unfeasible for firemarkers and OCs to mark the area weapon effects for every dismounted soldier and maneuver combat vehicle equipped with an area-fire weapon system.

-- Shooter and victim IDs. Trainers need this extrinsic feedback to identify shooters and victims involved in maneuver area-fire engagements for the AAR.

(2) FS

-- Capability for Enhanced Fiber Optic Guided Missile (EFOGM) gunner to pilot the missile, acquire a target and engage.

-- Actual flight route of the EFOGM. Trainers need this extrinsic feedback information to coach units on EFOGM employment and airspace coordination.

-- Mobility, firepower, and communications kill. Currently, manual adjudication of indirect-fire (precision-guided engagements) permits only two assessment options: fully operational (target not hit) or catastrophic loss (target hit).

(3) INT

-- Unmanned aerial vehicle (UAV) status-fully operational, communications kill, catastrophic kill. There is no TES system for the UAV.

-- Actual UAV flight routes and search areas. There is no instrumentation for UAVs that will provide this extrinsic data.

-- Time-tagged video and computer-generated replay of potential system acquisitions. There is no capability to determine what the UAV and other acquisition systems acquired or were capable of acquiring during the mission.

(4) AD

-- Ammunition type and amount fired. This data is not captured by the IS for extrinsic feedback.

-- Ammunition on hand. This data is available within the MILES TES system, but the IS does not capture this information for extrinsic feedback.

-- Vector pairing shooter to victim. Trainers need this extrinsic feedback to coach units on the employment of AD systems.

(5) MS

-- Mine sensor communication with the RCS for targets detected. There is no capability to simulate the communication from the Intelligent Minefield (IMF) to the RCS for targets detected by the minefield.

-- Remote Control Station communication with mine sensors for command detonation of WAM mines. There is no capability to simulate RCS communication for the command detonation of all or portions of the WAM minefield.

-- Thermal and millimeter-wave obscurant effects. There is no capability at the CTCs to simulate the effects of these obscurants in defeating thermal and radar acquisitions.

-- Biological Integrated Detection System (BIDS) and Multipurpose integrated Chemical Agent Alarm (MICAD) warnings. There is no capability to stimulate these detectors to portray the presence of nuclear, biological, chemical (NBC) agents.

Phase III: Assessing the Payoff for Successfully Implementing One or More of Fifteen TES Concepts

Overview

During Phase III of the ATESC Study, we determined the capability of the 13 TES strategies proposed in the TAAF Aids Study to meet the prioritized feedback requirements identified in Phase II. We refined and revised TAAF Aids strategies and developed additional high-level concepts to automate priority feedback requirements. The concepts describe capabilities that have the potential to:

- Reduce the level of effort by OCs and TAF analysts to simulate engagements, stimulate sensor systems, and collect and analyze engagement data.
- Provide feedback that is unattainable by current TES and IS.

In this section of the report we provide an overview of TES and IS capabilities today. Thereafter we discuss 14 high-level TES operational concepts; however, we offer no technical solutions. For each TES concept, we describe how the concept reduces OC and TAF analyst workload and eliminates data deficiencies. We also identify the types of weapon and acquisition systems supported by the concept.

Today's TES and IS

SAWE/MILES II is the primary TES system that provides battlefield effects for live, force-on-force training. MILES II simulates the effects of direct fire engagements using eye-safe laser transmitters. SAWE simulates indirect fire, nuclear, chemical, and some mine effects using controller actions and instrumentation towers to assess area weapon effects. MILES II requires minimal exercise control, but the fidelity of direct fire, LOS simulation is limited by laser technology.

For LOS engagements, the visual and audio cues produced by pyrotechnics on the firing vehicle or the dismounted soldier's blank rifle ammunition create a signature for acquisition by the targeted player. When killed, the target vehicle's MILES II actuates a continuous, blinking amber light informing the crew that their vehicle is out of action and notifying the firing

crew that they destroyed the target vehicle. Targeted dismounted soldiers receive intrinsic feedback indicating that they are out of action from the audio chirps emanating from their MILES harness. Upon hearing the MILES chirps, the targeted soldiers remove their helmets and sit down. These actions inform the shooter that he successfully engaged the dismounts.

MILES II has fidelity limitations that cause OCs to perform exercise control actions. MILES lasers will not penetrate minor obstructions. Tree leaves ("tree-leaf defilade") will obstruct the laser. Firing positions with berms ("MILES berms") that are inadequate to stop penetration by real ordnance will stop a MILES laser beam. Smoke and dust degrades the effectiveness of the laser and may preclude engagements at maximum range. For safety, JRTC rules of engagement preclude the use of MILES by dismounted soldiers for close-in engagements at less than 10 meters. OCs manually perform exercise control using laser pistols (control guns) in those instances where MILES fidelity limitations or safety preclude automatic casualty and battle damage assessments.

Although the shooter receives intrinsic feedback when he hits a vehicle (continuous, blinking amber light on the target vehicle), the feedback he receives when he misses the target is inadequate. If he near misses the target, the amber light will blink two times. If he misses the target by a considerable distance, the amber light on the target vehicle does not blink at all. For misses, the shooter receives no feedback to sense whether the ordnance fell short, long, left or right of the target. IS extrinsic data that pairs the shooter to the victim is unreliable. The IS does not captures 100 percent of the engagement pairings. The IS does not pair shooter to misses. Extrinsic feedback on all engagement pairings (shooter to victim and shooter to misses) is critical for the assessment of BLUFOR fire control and fire distribution and for the detection of near-fratricide incidents. See Figure 11 for MILES II limitations.

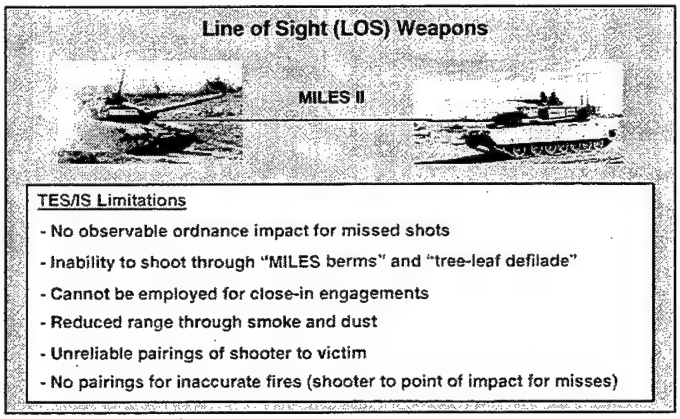


Figure 11. Limitations of laser-based technology.

SAWE assesses battle damage and casualties for NLOS area effects weapons. A blinking amber light on the target vehicle(s) indicates a near miss or kill just as in line of sight (LOS) engagements. Since soldiers do not wear Player Detection Devices (PDDs), OCs use laser control pistols to assess the effects of indirect fires against dismounts. For indirect fires against vehicles and dismounted soldiers, a Firemarker provides the visual and audio cues to simulate impacting ordnance. Firemarkers equipped with smoke generators or smoke pots produce the smoke for artillery and mortar smoke missions. Firemarkers use flares to simulate illumination produced by indirect fire units. Firemarkers may not be timely in marking fires because of the distance to the target, terrain and visibility conditions (day or night).

Unlike LOS engagements, NLOS engagements require intensive manning and control actions to produce the simulated effects. After extensive OC and TAF analyst coordination and considerable manual input into the SAWE control station, SAWE performs BDA based on the ammunition type, volume and accuracy of fires.

Unless the OC detects obvious gunnery errors by the mortar or artillery FDC or firing crews, the grid in the call for fire is the location marked and assessed for battle damage and casualties. SAWE receives no fire control data from the howitzers or mortars. Consequently, SAWE cannot project gunnery errors down range during force-on-force training unless the OC detects the errors. See Figure 12 for SAWE limitations.

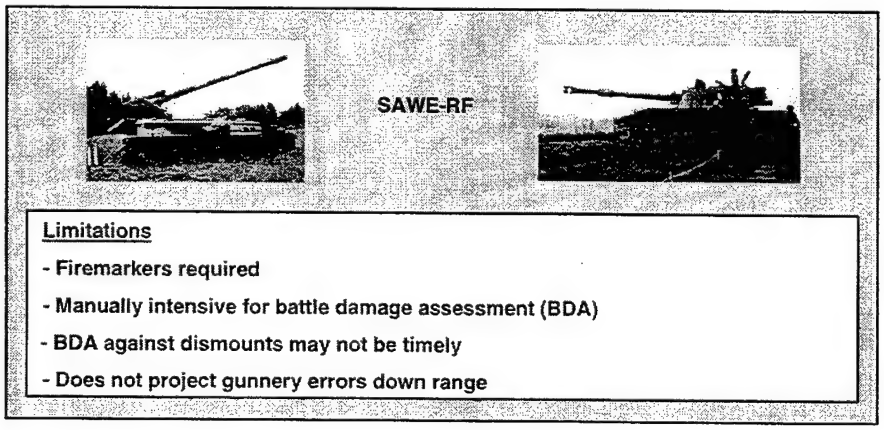


Figure 12. SAWE limitations.

TAF analysts use SAWE to execute and assess OPFOR fires on BLUFOR for notional OPFOR artillery. For chemical attacks, TAF analysts enter the affected area into the TAF workstation and notify OCs of exercise players in the area of the chemical strike. OCs assess casualties using their control pistols since players do not wear PDDs.

New TES Concepts

(1) Apply Embedded Simulation to NLOS Engagements.

Embedded simulation has the potential to reduce OC and TAF analyst control and data collection tasks substantially for NLOS engagements and, as a byproduct, improve the fidelity and extrinsic feedback of indirect fire simulations. In embedded simulation, the vehicle serves as a simulator as well as a tactical platform. Sensors embedded in the platform determine vehicle location, tube azimuth and elevation, and ammunition data. Next, they transmit the information through the IS to a NLOS TES model. The model calculates the "should hit" projectile location and performs BDA based on the "should hit"

location, ammunition type, volume of fires, and number and type of player entities in the target area (see Figure 13). Vehicle-mounted DIFCUE devices or Firemarkers provide signatures for the impacting ordnance. This concept also supports munitions guided by laser designation. As the observer designates the target, The NLOS TES model senses the ID and location of the observer, the target designated by the observer and any interruptions in the designation. The NLOS TES model compares the calculated maneuver footprint of the projectile with the target designated by the observers and assesses BDA accordingly.

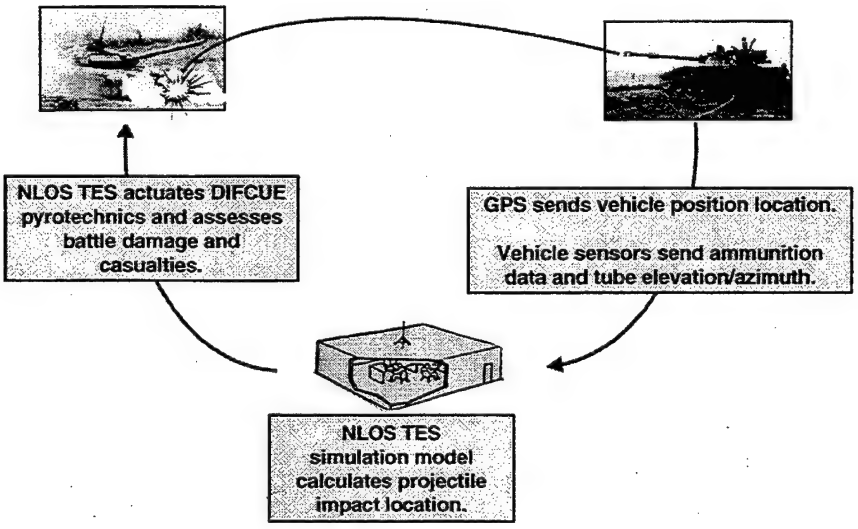


Figure 13. NLOS simulation model.

Since this simulation model derived the "should hit" location using actual firing data-- tube azimuth, tube elevation, ammunition type fired and platform location--the TAF analyst can perform some meaningful analysis. Based on the reports from the TAF analyst, the OCs can substantively coach the FDCs and the gun line. Since the simulation model generates indirect fires based on actual times for gunnery computations and howitzer/mortar crew procedures, the simulated effects down range better approximate the state of unit training. The concept will greatly reduce the TAF analyst's workload for precision-guided munitions such as Copperhead, and the Precision Guided Mortar Munition (PGMM). This concept is also extendable to the Apache, Comanche, Kiowa, and Longbow Apache HELLFIRE missiles. All of these aircraft platforms are capable of using the HELLFIRE missile systems in a self-designated (pilot laser designates the target with on-board laser) or

remotely designated (remote observer laser designates the target) mode.

The fidelity limitation of this concept is the responsiveness of the Firemarker. The marking of effects (flash-bang) for indirect fires against non-DIFCUE equipped vehicles and dismounts may not be timely resulting in the assessment of BDA before the Firemarker marks the impacting artillery or mortar rounds.

(2) Field and Upgrade Light Weight PDD

The PDD is an instrumentation device worn by soldiers involved in tactical engagement simulation training exercises. Because of the PDD's excessive weight (16 pounds) and bulk, CTCs do not require soldiers to wear the assembly. Consequently, all dismounted operations are uninstrumented. The soldier may kill and be killed through the MILES TES without the PDD, but no engagement data is transmitted to the IS. For area effects weapons such as artillery, mortars, mines and chemical attacks, OCs must manually assess dismounted casualties using laser control pistols. Since there is no transmission of the soldier's location to the IS without the PDD, OCs observe and report ground truth information on dismounted activities to the TAF using radio control nets. The TAF records and timelines the information for use in AARs. The Light Weight Player Detection Device (LW PDD) will significantly reduce the weight and bulk of the PDD harness and provide a practical assembly to instrument dismounted operations.

The purpose of the PDD is to simulate the effects of direct and indirect fire by receiving coded laser beams and radio signals from opposing weapons. The SAWE MILES II PDD is two systems in one. The MILES II technology is an improved MILES system that reacts to direct fire only. The SAWE system assesses the wearer of the PDD for indirect fire and area weapon effects. This concept proposes that the LW PDD be upgraded in two ways. First, upgrade the LW PDD to provide extrinsic feedback on shooter to victim pairings. Second, upgrade the PDD to provide extrinsic feedback on the type weapon fired (NOTE: The Objective Individual Combat Weapon will permit the individual soldier to engage point targets with 5.56-mm ammunition and area targets with air-bursting 20-mm ammunition). The fielding of the LW PDD will dramatically reduce OC workload in

assessing indirect fire and chemical casualties. The proposed upgrades will also reduce OC data collection requirements for shooter to victim pairings and will support simulation of 20-mm area fire engagements (see next concept, entitled "Implement MILES/SAWE projection").

(3) Implement Area Fire Projection

This concept proposes a MILES to SAWE-like interface to assess direct fire area effects by weapons such as the Objective Individual Combat Weapon (OICW) (see Figure 14).

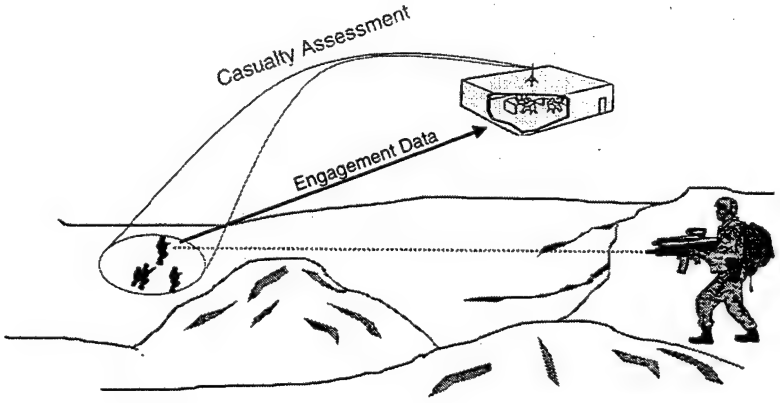


Figure 14. OICW engagement using area fire projection.

In Figure 14, a soldier armed with the OICW elects to engage a squad of dismounted infantry with 20-mm air-bursting ammunition. The soldier sights on one OPFOR soldier in the center of the squad and fires the OICW. The targeted soldier's LW PDD receives kill words indicating engagement by five OICW 20mm rounds and transmits this information with the victim's player ID and location through the instrumentation system to SAWE. SAWE identifies the location of the impacting 20mm ordnance, calculates the radius of damage and probability of kill (Pk), compares the location of OPFOR soldiers to the radius of damage, and assesses BDA accordingly through the victims' LW PDD. The victims receive intrinsic feedback indicating they are out of action by the audible chirps from their Man-Worn Detection Device (MWDDs). The shooter receives feedback on the effects of his engagement when the victims remove their helmets and sit down indicating that they are out of action. (NOTE: when we mention SAWE, we

are referring to the current SAWE or the new area weapons TES that replaces SAWE.)

This concept will support other direct-fire weapon systems such as the Objective Crew Served Weapon (OCSW), MK-19 40mm Grenade Machine Gun, and M203 Grenade Launcher. Modifying the laser so that it projects a wider beam at each increment in range will permit simulation of the Claymore mine and HYDRA-70 Rocket. Incorporating a weak radio frequency (RF) transmitter in hand grenade shells that emit a signal upon striking the ground will permit simulation of hand grenades. This approach also permits simulation of other emplaced devices such as the Electric Vehicle Stopper.

This concept presumes that the government has fielded the LW PDD and modified SAWE to receive PDD data (victim ID, firing event data, etc.) to support the calculation and assessment of BDA. The concept has a major fidelity limitation. If the soldier firing the OICW misses the OPFOR soldier, the firing soldier receives no feedback. For the Area Fire Projection concept to work, the firing soldier must successfully engage one LW PDD equipped soldier in the target area. For the Area Fire Projection concept to work, the firing soldier must successfully engage one LW PDD equipped soldier in the target area.

(4) Apply Range Qualification Scores to Pk for MILES Kills

This concept integrates soldier and crew weapon qualification scores into MILES casualty and battle damage assessments. During equipment initialization, the rotating unit provides range qualification scores for all soldiers and crews to CTC instrumentation personnel. CTC personnel enter these scores into the laser transmitter with the weapon type, i.e., M16, Score 222. This concept causes a soldier who scored as a "Marksman" with his M16 to have a corresponding MILES kill capability of a "Marksman." This calibration procedure also applies to mounted and dismounted crew served weapons sections. Soldiers and crews cannot apply actual gunnery procedures during MILES engagements (i.e., apply super elevation for tank engagements). This concept compensates for the absence of these procedures and produces direct-fire engagement results that more closely approximate soldier and crew marksmanship and gunnery proficiencies.

This concept has no effect on OC or TAF functions or unattainable feedback; however, it will increase the fidelity of the simulations to show a more realistic portrayal of the units actual fighting capability.

(5) Automate Mine/Sensor Effects

The simulation of minefields is one of the most manpower intensive activities on the live force-on-force battlefield. Currently, engineer OC's verify player procedures for the emplacement of minefields and provide the location of the area affected by each minefield to the TAF analyst. The OC manually assesses the effects of the minefield by marking mine detonations with pyrotechnics and adjudicating casualties and equipment damage with his laser/control pistol. These procedures requires full time "eyes" on the minefield which isolates the OC and precludes observation, coaching and mentoring of his BLUFOR counterpart.

To simulate RAPTOR engagements, OCs and TAF analysts perform extensive coordination before the engagement event. The OC monitors BLUFOR emplacement of the minefield and records the grid location of each mine. The OC provides the location of the individual mines to the TAF analyst. The TAF analyst plots the location of each mine in the WAM computer and enters a 100-meter attack radius around each mine location. During mission execution, the TAF analyst monitors vehicles approaching the minefield. If a vehicle enters the 100-meter attack radius of an emplaced mine, the WAM computer assesses battle damage against the vehicle through the IS. Concurrently, the TAF analyst notifies the OC to mark the WAM engagement. The OC shoots a flare into the air with a pyrotechnic pistol to simulate WAM air-bursting munitions then throws a grenade simulator to simulate the top-down attack against the BMP. The OC manually performs all BDA for breaching operations. Neither SAWE nor the WAM computer can simulate a breach/lane in a minefield. Both TES systems will kill all exercise players encroaching on the minefield. The simulated minefield is either on or off. There is no capability for TAF analysts to designate a breached lane through the minefield so that vehicles can move through the lane unharmed. Consequently, OCs manually adjudicate minefield BDA during breaching operations. There is no

capability to simulate minefield sensor transmissions to the RCS operator for targets detected or requests for reinforcing fires. There is no capability to simulate the RCS operator's capability to command detonate all or part of the minefield.

This concept proposes the installation of instrumentation in mines and sensors, which comprise the minefield. When the sensor (i.e., the Integrated Acoustic System) transmits its location to SAWE, SAWE automatically plots each sensor's location in the TAF workstation. SAWE also senses player entities that approach the sensor and reports these detections directly to the RCS through an IS interface. Each mine is also instrumented and transmits its location to SAWE, which plots the mine's location in the TAF workstation. The workstation will show the radius of damage for the mines and a detection radius around the sensors. Interfaces between the instrumentation system, the player engineer's RCS, and SAWE enable the player to command detonate all or portions of the minefield, or to set the mines for self-activation. For self-activated mines, SAWE will automatically assess the target when the target enters the minefields effective attack radius. The victim will receive feedback on ordnance effects through a PDD or a Vehicle Detection Device (VDD).

For the breaching of dumb mines, SAWE will trace the lane cleared by the breaching vehicle and permit follow-on vehicles that follow the lane to move through the minefield unharmed. For Mine Clearing Line Charge (MICLIC), the engineer OC will provide the coordinates for the start and ending point of the line charge. The TAF analyst will enter this data into SAWE, which will deactivate the mines along either side of the line charge in accordance with an established Pk. SAWE will treat the breaching of smart mines with a self-defense, top-down attack capability in a similar manner. As the Off Road Smart Mine Clearance (ORSMC) System moves through the minefield, SAWE will compare the area affected by ORSMC signals with the locations of each mine and deactivate mines accordingly.

(6) Pair Shooter to Victim

Discussions with OC's and TAF analysts at the CTCs indicate that shooter to victim engagement pairings occur less than 100 percent of the time. This adversely affects

the fidelity of extrinsic feedback data for training analysis and AARs. NTC OCs informed us that the current TES/IS produces raw data that an analyst may manually cross-reference to pair shooter-to-victim for each successful engagement. This is terribly time consuming and an unpractical task to accomplish during the limited time between change of mission and the AAR.

Under the Pair-Shooter-to-Victim concept, MILES continues to support direct-fire simulations but successful engagements cause the transmission of data to the IS which automatically displays shooter-to-victim pairings at the TAF workstation. Upon a hit, the victim's VDD or PDD collects MILES engagement data and transmits the shooter ID, victim ID, ammunition type, hit/kill aspect angle, kill code, and victim's status change to the IS. The IS determines the location of the shooter and the victim at the instance of the engagement and constructs a vector from the shooter to victim on the screen of the TAF workstation.

(7) Pair Shooter to Misses

Using embedded simulation to simulate direct-fire engagements in the live environment is not possible today. In embedded simulation the vehicle serves as a simulator as well as a tactical platform eliminating the need for MILES laser transmitters and receivers. Sensors embedded in the platform determine vehicle location, tube azimuth, tube elevation and ammunition data then transmit fire control solutions through the IS to a simulation model. The model calculates the "should hit" projectile location and determines BDA by comparing player locations in the target area with the "should hit" location for the ordnance. The model passes the BDA assessment to the IS, which executes the BDA and takes the player(s) out of action in the training area. Unfortunately, there is an inherent position error in live instrumentation that precludes the use of embedded simulation for direct fire engagements against point targets. These entity location errors do not affect the observation and assessment of BLUFOR maneuver. However, the instrumented position locations lack the precision required for a simulation model to determine hits or misses for weapons engaging point targets (see Figure 15).

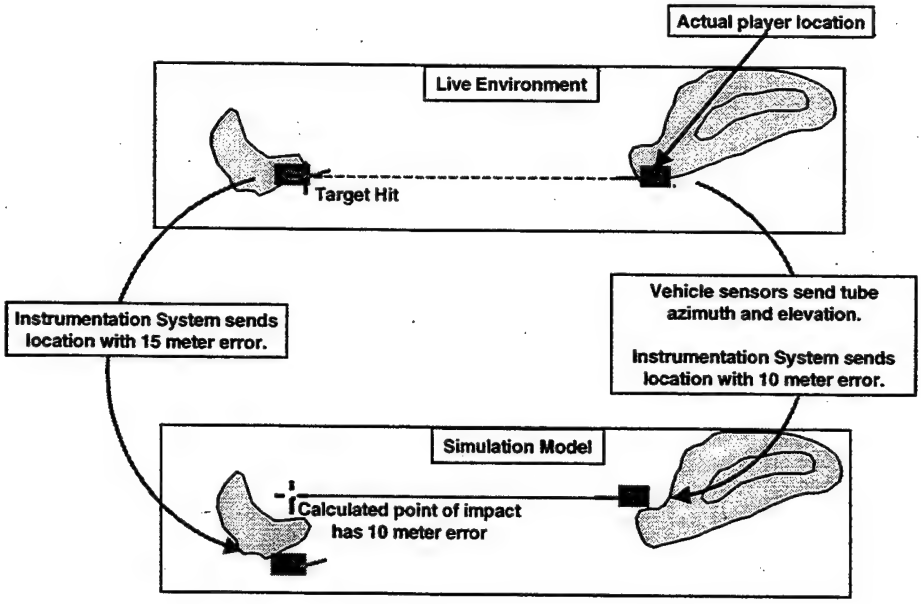


Figure 15. Inherent error in instrumented position locations.

In Figure 15, the BLUFOR player is actually located along the southwestern ridge of a hill mass. However, the instrumentation system reports the player's location 10 meters north of his actual position causing the LOS simulation model to position the BLUFOR player on the opposite side of the hill. If an entity's instrumented location has a minor error, the LOS simulation model will contain the same error and promulgate the error during firing events by that entity. In Figure 15, the BLUFOR entity actually hit the target, but the LOS simulation model calculated a miss because of the instrumented position location error of the firer and the target vehicle.

Although the embedded simulation concept may not be practical for simulating direct-fire hits of point targets, it does have potential in augmenting MILES for the collection of data on direct-fire misses. Displaying the impact location of misses as well as MILES hits/kills can assist TAF analysts and OCs in assessing the distribution of fires and reveal near-fratricide incidents not displayable by the current IS.

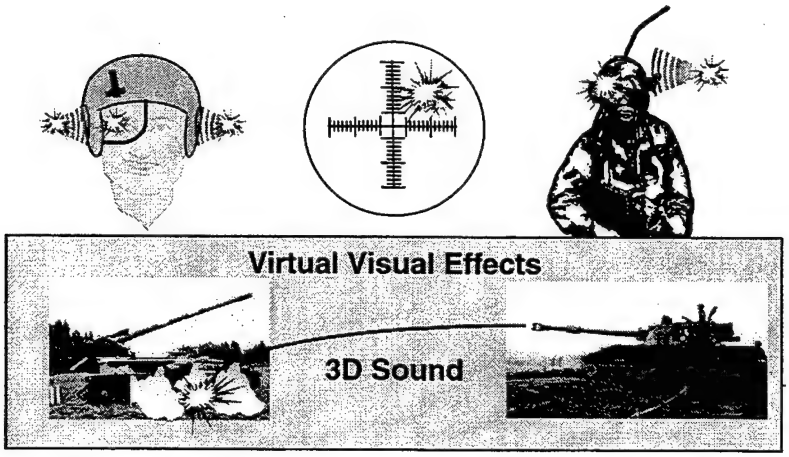
In the Pair Shooter to Misses Concept, each mounted direct-fire system has sensors to transmit firing data to a

simulation model. The model calculates the point of impact for the trajectory, and then queries the IS for MILES engagement results for the same engagement. If the IS indicates that the MILES engagement is a hit, the simulation model does nothing. If the IS does not report a hit, then the simulation portrays the impact location of the miss on the TAF analyst's screen.

(8) Provide Virtual Simulation of Artillery and Mortar Effects

Today, the OC collocated with the howitzer or mortar platoon FDC monitors both the call for fire from the observer and FDC procedures in the determination of fire mission data. The FDC OC passes the target location, projectile type, number of projectiles to be fired and the firing units to the TAF analyst for entry into SAWE. An OC collocated with the howitzers/mortars observes crew actions in preparing for the fire mission and notifies the FDC OC of any errors in weapon lay and ammunition preparations. The FDC OC informs the TAF analyst of any gunnery errors. The TAF analyst fires the mission in SAWE to view the impact location of the artillery or mortar rounds on his screen while SAWE assesses BDA against VDD equipped vehicles. The TAF analyst also notifies a nearby Firemarker or OC to mark the fires with ground and air burst artillery simulators. Since dismounted soldiers do not wear PDDs, an OC must assess indirect fires effects with his control gun.

The concept of virtual simulation of battlefield effects eliminates pyrotechnics and firemarkers for the simulation of lethal indirect fire munitions by providing the NLOS TES model (first concept discussed) the capability to project virtual visual and audio effects down range. See Figure 16.



Pluses

+ Dramatic reduction in pyrotechnics
+ Gunnery error projection
+ High fidelity extrinsic feedback
+ Minimal control requirements
+ Timely assessments
+ Timely marking of lethal effects

Minuses

- Firemarkers needed for smoke and illumination

Figure 16. Virtual simulation of artillery and mortar battlefield effects.

This strategy integrates a heads-up virtual monocle into the combat vehicle crew (CVC) helmet, dismounted soldier's helmet and vehicle gunnery sights to produce 3D visual effects. Earphones provide 3D sound, allowing players to hear and sense the approximate vicinity of exploding ordnance. This strategy provides players the capability to view and hear virtual terminal effects of impacting projectiles generated by the NLOS simulation model. The strategy ties the timing for the production of virtual effects to player actions vice OC, TAF, and firemarker control actions. The observers call for fire, the FDC's gunnery computations, and howitzer/mortar firing procedures determine when and where indirect fires are assessed and marked.

This concept has great potential to not only reduce the number of firemarkers required and pyrotechnics expended during training rotations, but to also produce timely indirect fire effects. This strategy will not totally eliminate firemarkers. Firemarkers must still mark illumination and smoke missions. Virtual illumination rounds may light up a heads-up display, but then will not

illuminate live players. Virtual smoke may obscure the player's vision through a heads-up display, but will not obscure the vision of the naked eye.

(9) Provide Tactile Feedback to Support Non-Lethal Engagements

Operations other than war are becoming more frequent, more complex and politically charged. These new missions bring an increased use of non-lethal weapons, such as the beanbag round and the aqueous foam barrier. Current TES systems do not support these new weapon systems. Non-Lethals pose special challenges for the realism of training. For example, MILES players exist in one of two states. They are either "on" or "off." If a player's MILES sensor receives laser energy, a loud audible alarm goes off. If the player receives a direct hit, he must inactivate his laser transmitter to silence the alarm. This player is now "out-of-action." For intrinsic feedback on the damage sustained, the player must take out a casualty card to identify the extent of his/her wounds. This type of "on" or "off" feedback is sufficient when dealing with deadly weapons like machine guns, but in the non-lethal arena, there are many different levels of effects that are possible. For example, units may employ the aqueous foam barrier to provide a visible, non-lethal barrier to deter antagonists from entering protected areas. The aqueous foam barrier may use irritants that produce symptoms ranging from CS (tear gas)-like eye irritations to incapacitating skin irritation depending on the antagonist's exposure and proximity to the barrier. If the antagonist physically contacts the barrier, the effects will completely incapacitate him for an extended period of time.

There are other challenges posed by non-lethal weapons:

-- If a reconnaissance soldier starts to enter an area that has an aqueous foam barrier in place, it would be inappropriate to instantly activate his MILES gear. This could give away his position (loud audible alarm) and require him to remove the transmitter key from his MILES equipped M-16 (inactivating his rifle).

-- The aqueous foam barrier has varying degrees of effect and generally does not "disarm" its targets, unless a target contacts the barrier or remains in close proximity to it for a lengthy time.

-- Once a player's MILES harness activates an audible hit alarm and disables the player's weapon, an OC may have to physically "re-key" or "re-activate" that player. Non-lethal weapons may only temporarily disable a player.

Safety precludes using an actual foam barrier during live training. Simulation is necessary. A possible solution is that the training unit uses actual foam generators with non-toxic foam to produce a visual indication of the foam barrier. To automate casualty assessment, OCs use Mine Effects Simulators (MES) modified to transmit foam barrier kill words and toss the simulators into the foam barrier. All players participating in the exercise wear tactile devices. As the soldier moves closer to the foam barrier, the tactile device taps harder and faster as he gets closer to the MES. This provides a "warning" sensation to the soldier. When the soldier moves away, the tactile device reduces the tactile response and the soldier continues the mission without activating his MILES or compromising his position. On the other hand, if that soldier refuses to heed the warnings and continues to move toward the barrier, the MES signal energy gets stronger and stronger ultimately setting-off the soldier's MILES. The soldier's PDD recognizes that the MES signal represents a non-lethal casualty status. The PDD consults a look-up table and waits the prescribed time before resurrecting the soldier's MILES. This approach accounts for temporary incapacitation resulting from non-lethal engagements and eliminates the need for an OC to resurrect temporarily incapacitated players. In this example, the player could feel the tactile device "tapping" him, but the device could produce any number of other sensations, such as a slight shock or a vibration. The vibration could be similar to that of a wireless vibrating pager.

(10) Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target Engagements

If position location technology in live training matures to the point that actual location equals

instrumented location, embedded simulation can automate mounted direct-fire assessments without the use of laser transmitters and receivers. Embedded simulation permits the vehicle to serve as a simulator as well as a tactical platform. Under this concept, the weapon platform has embedded sensors, which determine vehicle location, tube azimuth, tube elevation and type ammunition fired. Vehicle sensors transmit fire control data through the IS to a simulation model. Using the fire control data, the simulation model calculates the "should hit" location for the ammunition fired and automatically assesses casualty or battle damage against player entities in the target area. The victim receives an indication of a hit or near miss through his VDD or PDD and an engagement vector appears on the screen of the TAF analyst workstation depicting a shooter-to-victim or shooter-to-miss pairing.

This concept also provides virtual imagery and sound to depict terminal ordnance effects for direct-fire signatures, hits and misses as discussed in Concept 8- Virtual Simulation of Artillery and Mortar Battlefield Effects.

(11) Automate Stimulation of Counterfire Radars

NTC uses the RSS to stimulate Q36 Firefinder Radars with artificial projectile trajectories. The RSS is in the fire support TAF. When the TAF fires an OPFOR artillery or mortar mission, a TAF analyst passes the mission to the RSS operator. The RSS operator electronically queries the Q-36 and receives the radar's location, altitude, orientation, zone, cueing status, etc. If the radar meets all parameters to acquire the projectiles, the operator enters the point of origin and impact grid into the RSS and transmits the data to stimulate the Q-36. At the Q-36, an alarm alerts the crew and the radar provides the locations of the firer and impacting ordnance.

Since CTC OPFOR units do not employ actual howitzers and mortars, implementation of Concept 1 (Apply embedded simulation to NLOS engagements) will not eliminate manual entry of OPFOR fire missions into SAWE. However, integrating SAWE with RSS can relieve a considerable workload in the fire support TAF. In this concept, when the TAF analyst enters the OPFOR fire mission into SAWE, SAWE transmits the point(s) of origin and impact

location(s) for the mission directly to RSS. RSS then stimulates the Q36 if the radar(s) meets all parameters to acquire the artillery or mortar trajectories. Providing the TAF workstation the capability to track all OPFOR indirect fire missions and BLUFOR fire missions would improve feedback during the AAR on counterfire missions conducted by BLUFOR.

(12) Automate NBC/Smoke Effects

Today, SAWE can simulate a chemical strike with extensive support from trainers; however, SAWE cannot simulate a biological or nuclear strike. To simulate a chemical strike, the TAF analyst enters the target area provided by OPFOR into SAWE. If the strike is a non-persistent agent, SAWE simulates the drift and dissipation of the chemical cloud based on the wind direction and speed provided by an OC in the exercise area. Based on targeting information provided by the TAF, OCs mark the chemical strike with pyrotechnics and CS grenades. SAWE also activates M8 chemical detection alarms in the affected area to simulate the presence of a chemical agent. OCs manually adjudicate casualties inflicted by the chemical strike since players do not wear PDDs that interface with the instrumentation system. If the chemical is a persistent agent, the contaminated area may remain effective for days. Again, OCs manually adjudicate casualties by evaluating BLUFOR protective actions and the thoroughness of unit decontamination procedures. The development and fielding of the LW PDD has the potential to dramatically reduce OC workload and distraction from observation duties (See concept 2.).

This concept proposes the installation of sensors on the MICAD and BIDS for stimulation by SAWE. This is an extension of the current capability that SAWE uses to stimulate M8 chemical detection alarms.

For smoke operations during force-on-force training, the CTCs use smoke generators to simulate the effects of smoke produced by artillery and mortar smoke munitions to screen/block visual acquisitions. For smoke produced from smoke generators, players use organic smoke generators to produce the smoke. Although the CTCs have the capability to produce smoke that inhibits visual acquisition, the CTCs have no capability to simulate thermal, millimeter wave or

multispectral smoke. This concept proposes an interface between smoke generators and the IS and a simulation model to calculate the effects of the smoke against precision guided munitions. The smoke generator operator will enter the type of smoke produced by the generator into a digital communication interface, which will transmit the type of smoke through the IS to the TAF workstation. Based on the type of smoke produced, weather conditions in the exercise area, and calculated area affected by the smoke, a simulation model will degrade the effects of precision munitions by reducing the Pk. For example, if OPFOR employs a thermal obscurant during a BLUFOR indirect-fire Copperhead fire mission, the simulation model will consider the effects of the obscurant on the Copperhead engagement. Using the Copperhead footprint and the area affected by the thermal smoke, the simulation model will degrade the Pk of the Copperhead ordnance accordingly. For direct-fire precision guided weapons simulated by MILES, smoke will degrade the effects of the MILES laser regardless of the type of smoke employed. When Embedded Simulation simulates mounted direct-fire engagements without the use of MILES (see Concept 10), then a simulation model can degrade the effects of direct-fire precision guided weapons in the same manner as indirect-fire weapons.

(13) Instrument UAV and Interface the Ground Control Station (GCS) with the IS

The UAV GCS operator views real-time imagery and passes UAV video and reports to the Bn TF S2. Nothing is simulated. Exercise players perform all tasks interfacing with actual equipment and other exercise players. However, TAF analysts and OCs must perform manual data collection to determine how well BLUFOR employed the UAV to acquire OPFOR dispositions and ascertain enemy activities. The OC questions BLUFOR players to determine the planned flight route and search areas for the UAV and passes this information to his TAF analyst counterpart. The TAF analyst plots the UAV's planned flight path and compares the named areas of interest (NAIs) and target areas of interest (TAIs) in the reconnaissance and surveillance plan to the search areas assigned to the UAV. The analyst and OC then collaborate to determine if the UAV's flight plan meets the commander's critical information requirements. Since there is no TES system for the UAV, OPFOR cannot kill the aircraft. Since the UAV is not instrumented, the TAF analyst cannot track the UAV's actual flight path against

the planned route. The analyst cannot view UAV imagery and compare potentially acquirable targets depicted on his ground truth display with those acquired by the UAV. The analyst cannot compare the UAV acquisitions to the dispositions of the threat on the S2's enemy overlay. Without TES/IS enhancements, trainers will not obtain sufficient information from UAV flights to coach and mentor their BLUFOR counterparts.

This concept proposes instrumenting the UAV to make the aircraft vulnerable to ground-to-air fire and to permit near-real time tracking of the aircraft. This concept also proposes an IS interface to the GCS that permits the TAF analyst to view UAV planning information and near-real time UAV video.

(14) Automate RSTA Systems Detection Information

During force-on-force simulations, exercise players employ actual RSTA equipment to acquire their opponents. Although players receive intrinsic feedback from most RSTA operations by interaction with actual equipment and other players, extrinsic feedback to support AARs and coaching on the employment of RSTA systems is a problem. For example, the GSR AN/PPS-5 section operator views real-time indications and detections for mounted and dismounted targets and passes reports to the Bn S2. Nothing is simulated. Exercise players perform all tasks interfacing with actual equipment and other exercise players. However, TAF analysts and OCs must perform manual data collection to determine how well BLUFOR employed the GSR to acquire OPFOR movement and ascertain enemy activities. The OC questions BLUFOR players to determine the planned search sector and target criteria for the GSR. The TAF analyst plots the GSR search sector and compares the NAIs)and TAIs in the reconnaissance and surveillance plan to the sectors assigned to the GSR. The analyst and OC then collaborate to determine if the use of the GSR meets the commander's critical information requirements.

This concept proposes the installation of sensors on each RSTA system to transmit data to the IS on the surveillance system's location, orientation, search sector, cueing status, and entity detections by time, type and location. Using this sensor data, the TAF workstation displays the search sector for the acquisition system and

displays the location of BLUFOR-acquired entities as well as IS-tracked entities. Colors or icon design permits the analyst to discern IS-tracked entities from those entities acquired by BLUFOR surveillance systems. Presentation of surveillance data in this manner enables the analyst to compare actual system detections to actual OPFOR dispositions and determine the effectiveness of BLUFOR surveillance. Comparing actual BLUFOR detections with reported OPFOR dispositions can also reveal the effectiveness of BLUFOR's reporting and dissemination of intelligence information.

(15) Automate EFOGM Simulation

The EFOGM simulation requires intense OC and TAF involvement to provide intrinsic and extrinsic feedback. To simulate the EFOGM engagement an OC at the observer location provides the target location to the TAF analyst. The OC at the EFOGM section receiving the fire mission records the launcher ID, planned flight route, ammunition on hand, and missile launch time and informs the TAF analyst. The TAF analyst plots the target location, identifies the location of the EFOGM and manually draws the planned flight route. Based on the fiber optic cable the missile will consume for the planned flight route, the TAF analyst plots the loiter radius (search footprint) of the missile. If a target is at the target location in the call for fire, the TAF analyst assesses battle damage using the maximum Pk. If there is no target at the call-for-fire target location, the EFOGM operator can still "search" for targets within the weapon's footprint. To simulate this search capability, the TAF analyst assesses the target at a lower Pk if the target is within the footprint but not at the location in the call for fire. This simulation procedure is very labor intensive and does not allow the gunner to "fly" the missile to the target as he would in combat.

As an alternative to the manual control procedures described in the previous paragraph, we propose a concept that interfaces the IS to the EFOGM gunner's console and produces a Stealth View. The Stealth View is a virtual simulation capability that provides an out-the-window, three-dimensional view from any geographical location. The Stealth View allows the operator to move to any location on or above the battlefield. Stealth technology can be reused

to simulate EFOGM video as the missile travels down range. When the gunner launches the missile, he views the terrain beneath the missile, navigates the missile across checkpoints, acquires the target and flies the missile into the target as he would in an actual EFOGM engagement.

Under this concept, the gunner's console interfaces with the IS. When the gunner enters his planned flight route for the mission, the route appears on the TAF analyst's screen. As the gunner navigates the missile down range, the actual route of the missile, the missile's footprint and the point of impact appear on the TAF analyst's screen.

Concept Scoring Methodology

In this section of the report, we discuss the methodology we formulated to prioritize 14 concepts proposed in the previous section. We did not include Concept 4 (Apply range qualification scores to Pk for MILES kills) in the bar chart. Our analysis revealed that this concept may improve simulation fidelity but it will not eliminate CAF functions or data deficiencies.

To determine the contribution each concept made to reduce the burden on the trainer and reduce data deficiencies we used the following methodology. First, we identified elements of trainer provided-feedback the concept would automate, and then identified the CAF functions that produced the feedback. For example, to provide a visual/audible indication of impacting artillery to the fire support observer and targeted victims (intrinsic feedback), trainers must execute 15 CAF functions (i.e., receive fire mission data from OC and enter into TAF workstation). Second, we identified data deficiencies eliminated by the concept, i.e., shooter-to-victim pairings for direct fire engagements (extrinsic feedback). Third, we identified the tactical systems and BOSs affected by the concept. Figure 17 summarizes our approach.

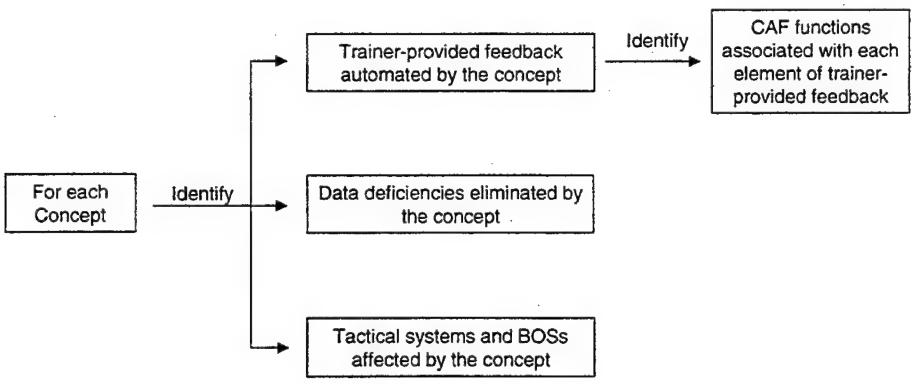


Figure 17.Determining the benefits of proposed concepts.

Recall that we developed a scoring methodology to quantify the adverse impact of CAF functions on the OC and TAF analyst's ability to observe, mentor and perform training analysis (See Table 1 discussed earlier in the report). In our scoring methodology, we considered the CAF function variables listed below to evaluate the impact of each function on OC and TAF analyst workload and heavily weighted the last two variables. A high CAF function score indicates that the function has a major impact on trainer workload.

(1) Function duration

(2) Function repetition

(3) Function complexity

(4) Number of personnel who perform the function

(5) Function training requirement

(6) Function's potential to distract trainer from observation or analysis duties

(7) Function's potential to overwhelm trainer

Recall that unattainable feedback/data deficiencies are those intrinsic cues to the players during the exercise or extrinsic data elements needed for the AAR that cannot be provided by the current TES/IS or trainer control actions. In our analysis of each tactical system, we identified unattainable intrinsic feedback that is

essential for the simulation of the system during collective training exercises. We also identified unattainable extrinsic feedback that is essential to assess BLUFOR's performance in the employment of the tactical system. To quantify the impact of unattainable feedback we used a single value. We derived the value in the following manner. First, we determined the average CAF function score. Then we compared the average function score to the highest CAF function score and determined the value at the mid point between the two scores. The value we assigned to data deficiencies had the effect of equating all unattainable feedback to high scoring CAF functions. We felt this was a prudent approach, since we considered unattainable feedback critical to the simulation of the system or AAR feedback.

We also developed a scoring methodology to quantify the value of a given concept based on the tactical systems the concept supported. We designed the scoring and weighting methodology to produce higher scores for systems with near and mid term fielding dates (see Table 2).

Table 2.

Scoring Methodology for Considering Impacts of Number of Tactical Systems Associated with a CAF Function and Time Remaining before Fielding of Each System on Prioritization of CAF Functions

Scoring Criteria	Weighting
Number of near-term systems (Present - FY01)	x3
Number of mid-term systems (FY02 - 07)	x2
Number of far-term systems (FY08 - 13)	x1

To quantify the benefits of each high-level TES concept, we summed the scores of all CAF functions automated by the concept, data deficiencies eliminated by the concept and systems supported by the concept. See Table 3. Appendix E provides a tabulation of all proposed TES concepts and the feedback, CAF functions, and tactical systems associated with each concept. For each concept, the appendix totals the number of CAF functions,

unattainable feedback elements and tactical systems affected by the concept.

Table 3.

Overall Concept Score Components for a Sample New TES Concept

Concept: Apply Embedded Simulation to Non-Line of Sight (NLOS)

Concept Function Score:	3963	This concept automates 65 of 228 total CAF functions or 28.51%
Unattainable Feedback:	2448	This concept provides 36 of 96 total unattainable feedback elements or 37.5%
Concept Systems Score:	80	This concept affects 32 of 155 total systems or 20.00%
Total Concept Score:	5491	

Prioritization of Concepts

The bar chart in Figure 18 lists 14 proposed TES concepts along the X axis and the total CAF function and unattainable feedback scores for each concept along the Y axis. Recall, we did not include Concept 4 (Apply range qualification scores to Pk for MILES kills) in the bar chart. Our analysis revealed that this concept may improve simulation fidelity but it will not eliminate CAF functions or data deficiencies. The bar chart rank orders the concepts by total CAF function scores from left to right in descending order. The table above the bar chart depicts the number of tactical systems by BOS supported by the concept.

We will discuss the benefits of the first three concepts. Implementing the concept "Automate Mine/Sensor Effects will eliminate the greatest number of high scoring OC and TAF functions. " This concept affects 19 systems, including the RAPTOR, Integrated Acoustic System and Volcano. The concept eliminates 25 percent of the OC and TAF analyst functions performed and 12 percent of the intrinsic and extrinsic feedback data deficiencies. Implementation of the concept "Apply embedded simulation (ES) to NLOS engagements" affects 31 systems, including aircraft capable of firing the HELLFIRE missile, artillery and mortars. The concept also supports NLOS engagements of precision-guided munitions, such as the Precision Guided Mortar Munition and the Copperhead projectile. Appendix E reveals that this concept eliminates 20 percent of the

functions OC's and TAF analysts currently perform and 37 percent of the data deficiencies identified during the study.

SYSTEMS BY BOS

AD	0	0	0	8	0	7	0	0	0	0	0	0	0	0
FS	0	20	22	0	0	0	0	0	0	0	0	2	0	0
INT	0	0	0	0	0	0	0	0	0	9	0	0	15	3
MS	19	0	0	1	13	1	0	9	0	0	1	0	0	0
MVR	0	11	0	57	0	31	13	22	35	0	1	0	0	0
TOTAL	19	31	22	66	13	39	13	31	35	9	2	2	15	3

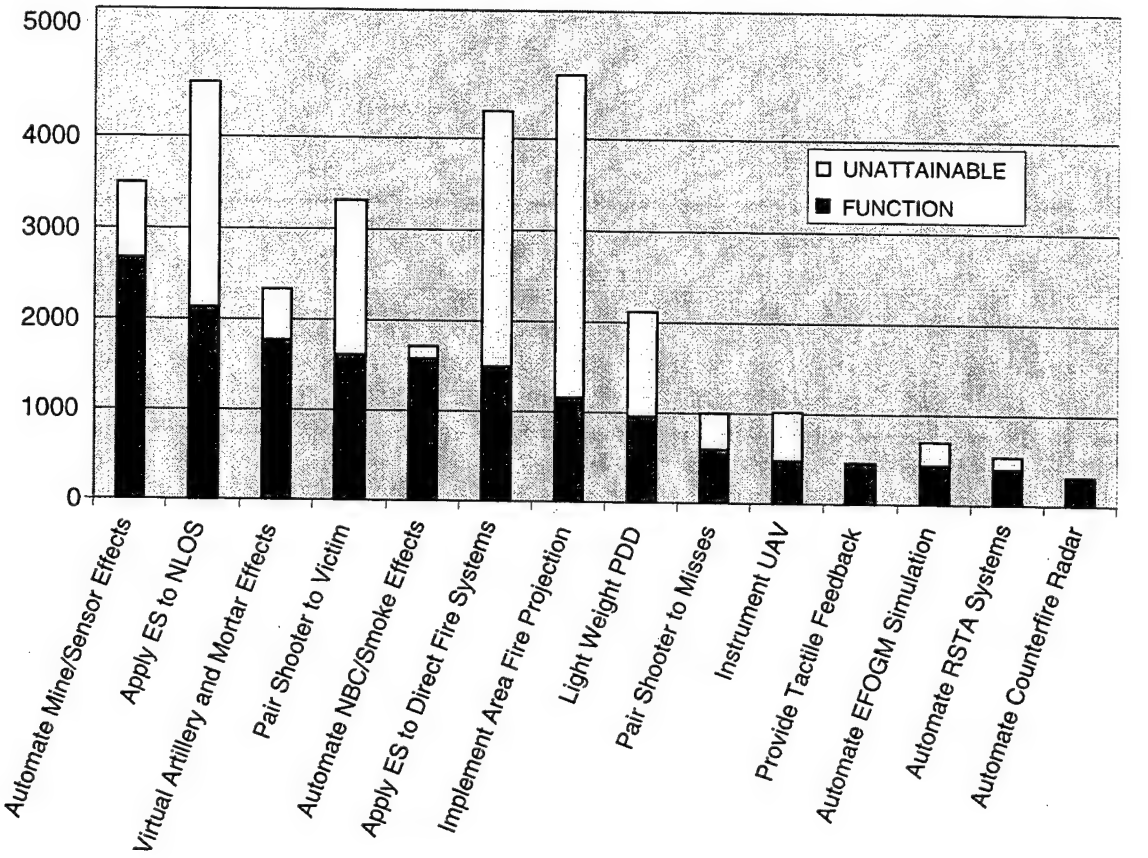


Figure 18. Prioritization of TES concepts when number of CAF functions supported is emphasized.

Implementing the concept "Virtual Simulation of Artillery and Mortar Battlefield effects" affects 22 artillery and mortar systems. The concept eliminates 17 percent of the OC, TAF analyst and Firemarker functions performed and would eliminate 8 percent of the data deficiencies available. Implementation of the first three concepts automates 62 percent of the OC, TAF analyst, and Firemarker functions performed and eliminates 58 percent of the data deficiencies.

The bar chart in Figure 19 prioritizes proposed TES concepts by total unattainable feedback scores from left to right in descending order.

SYSTEMS BY BOS

AD	0	7	0	8	0	0	0	0	0	0	0	0	0	0
FS	0	0	20	0	0	0	22	0	0	2	0	0	0	0
INT	0	0	0	0	0	0	0	9	0	0	15	0	0	3
MS	0	1	0	1	9	19	0	0	0	0	0	13	1	0
MVR	13	31	11	57	22	0	0	0	35	0	0	0	1	0
TOTAL	13	39	31	66	31	19	22	9	35	2	15	13	2	3

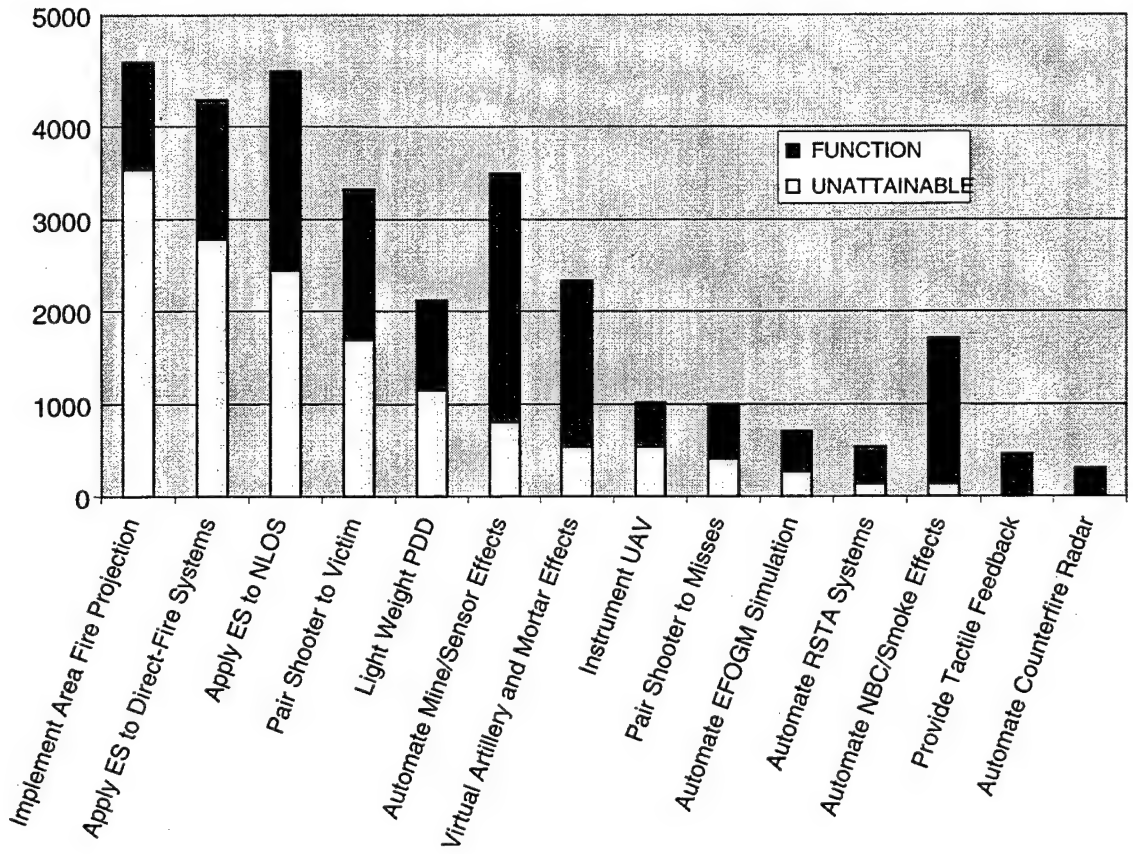


Figure 19. Prioritization of TES concepts when ability to address feedback gaps is emphasized.

The bar chart reveals that the concept "Implement Area Fire Projection" eliminates the highest number of intrinsic and extrinsic feedback deficiencies. This concept enables the simulation of several systems not currently simulated at the CTCs, i.e., HYDRA-70 and the MK-19 Grenade Machine gun. This concept also eliminates the unattainable feedback associated with the area fire capabilities of the OICW and the Objective Crew Served Weapon (OCSW). This

concept affects only 13 systems but eliminates 54 percent of the data deficiencies identified during the study. The concept "Apply ES to Direct-Fire Systems" affects 39 weapon systems. The pairing of shooter to victim and shooter to misses for MILES engagements comprises a large portion of the unattainable feedback this concept overcomes. The concept affects 39 systems and eliminates 42 percent of the unattainable feedback elements impacting on simulation of tactical systems or AAR feedback. The concept "Apply ES to NLOS" affects 31 systems, including aircraft capable of firing the HELLFIRE missile, artillery, mortars and precision guided munitions. Implementation of the first three concepts eliminates 82 percent of the data deficiencies identified during the study.

Next we evaluated each concept for its total impact by considering CAF functions, unattainable feedback and affected systems simultaneously. We used the Hierarchical Additive Weighting Method (HAWM) to weigh the three concept factors/benefits and to identify the TES concepts offering the highest payoff (U.S. Army Logistics Management College, 1989). We used Microsoft Excel to execute HAWM. See Table 4.

Table 4.

Using the Hierarchical Additive Weighting Method (HAWM) to Weight Concept Benefits

	Weighting							
Concept Factors	>	>	>	=	<	<	<	Concept Factors
	4	3	2	1	2	3	4	
SYSTEM						1		CAF FUNCTION
SYSTEM						1		UNATTAINABLE FEEDBACK
CAF FUNCTION					1			UNATTAINABLE FEEDBACK
								CONSISTENCY = 1%
								consistency should be < 10%

Table 4 lists the factors we used to evaluate each concept on the left and right side of the table. Using Saaty's Intensity Scale of Importance (the center columns of the Table 4), we identified the importance of each

concept factor by annotating a "1." Saaty's Intensity Scale of Importance allows the user to indicate the importance of one factor over another in multiple combinations (U.S. Army Logistics Management College, 1989). In evaluating concepts, we considered CAF functions and unattainable feedback to be more important than the number of systems the concept supported. In comparing CAF functions to unattainable feedback, we considered unattainable feedback slightly more important than CAF functions. HAWM calculates the consistency of the intensity scale and, if inconsistent, informs the user. The consistency of our weighting is 1%, which is well within the 10% standard. Using judgements of importance annotated in the intensity scale, HAWM next derives an overall weighting for each factor considering all combinations in the intensity scale.

The bar graph in Figure 20 considers the HAWM weightings and resultant scores for CAF functions, unattainable feedback and systems. The chart prioritizes proposed TES concepts from left to right in descending order.

SYSTEMS BY BOS

AD	0	0	7	8	0	0	0	0	0	0	0	0	0	0
FS	0	20	0	0	0	22	0	0	0	0	2	0	0	0
INT	0	0	0	0	0	0	0	0	9	0	0	15	0	3
MS	0	0	1	1	19	0	9	13	0	0	0	0	1	0
MVR	13	11	31	57	0	0	22	0	0	35	0	0	1	0
TOTAL	13	31	39	66	19	22	31	13	9	35	2	15	2	3

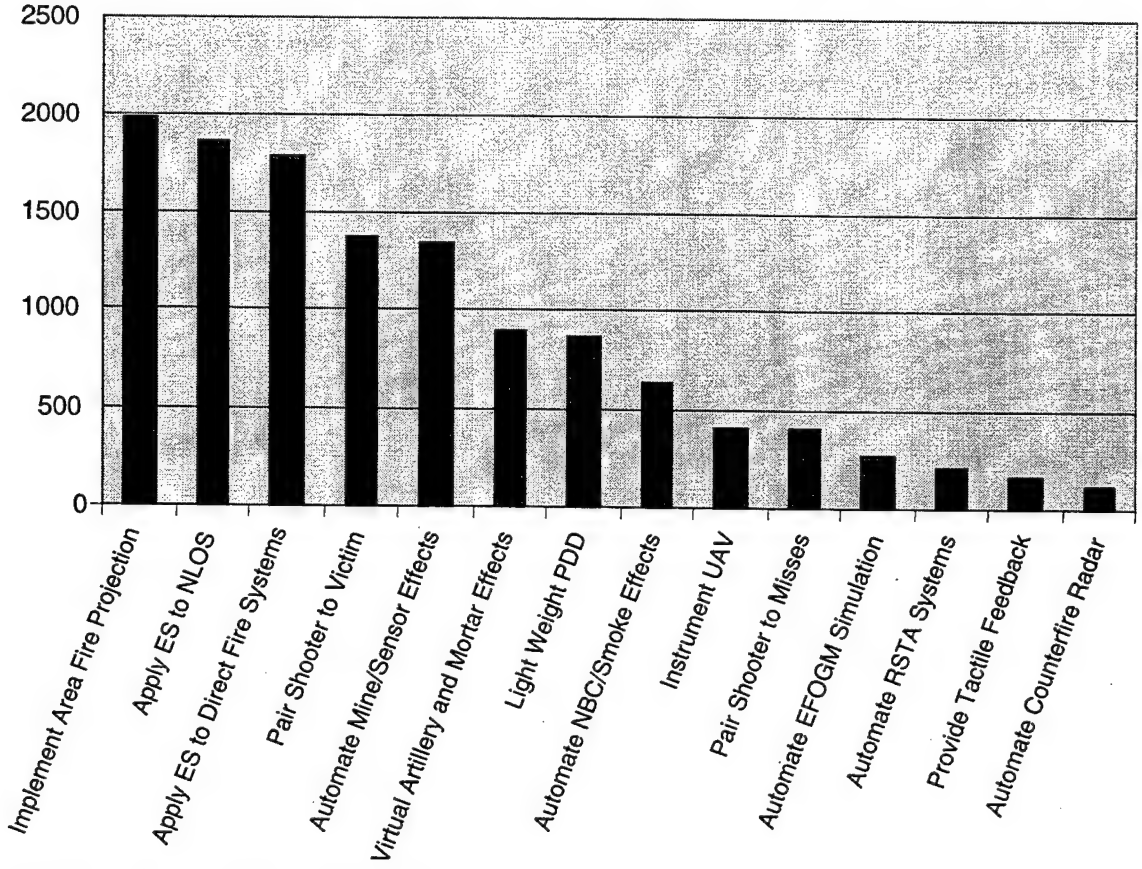


Figure 20. TES concept prioritization when number of CAF functions supported, number of systems supported, and number of feedback gaps addressed are considered.

The bar chart in Figure 20 does not consider the technical feasibility or the cost of implementing each concept. Examination of these factors was beyond the scope of the study. However, we discovered safety, technical and cost issues during our research that impact on priorities for concept implementation. The concept "Virtual artillery and mortar effects" is technically feasible but expensive. Further, the concept requires extensive research and testing from a safety aspect. Recall that this concept requires installation of heads-up monocles on individual soldier and crewmember helmets and modification of gunnery sights, so exercise players may view virtual battlefield effects, i.e., impacting artillery and mortar rounds. This

concept is obviously not a candidate for implementation in the near future. As we indicated in our discussion of the concept "Apply ES to direct fire systems," there are position location registration issues that preclude implementation of this concept in the near term (see Figure 15). In Figure 21, we realign concept priorities, considering the issues associated with both concepts, and move the two concepts to the end of the priority list.

Figure 21 provides our recommended priorities for concept implementation. Eliminating duplication of systems that apply across concepts, the top five TES concepts support 70 percent of the systems analyzed (109 of 155 systems). The five concepts will eliminate 59 percent of the functions performed by OC and TAF analysts and 75 percent of the intrinsic and extrinsic feedback deficiencies identified during the study. The phased execution of proposed TES concepts has the potential to eliminate unwieldy stovepipe TES systems that simulate direct-fire, indirect-fire, and area effects weapons and to stimulate RSTA systems such as the Firefinder radar.

SYSTEMS BY BOS

AD	0	0	8	0	0	0	0	0	0	0	0	0	0	7
FS	0	20	0	0	0	0	0	0	2	0	0	0	22	0
INT	0	0	0	0	0	0	9	0	0	15	0	3	0	3
MS	0	0	1	19	9	13	0	0	0	0	1	0	0	1
MVR	13	11	57	0	22	0	0	35	0	0	1	0	0	31
TOTAL	13	31	66	19	31	13	9	35	2	15	2	3	22	39

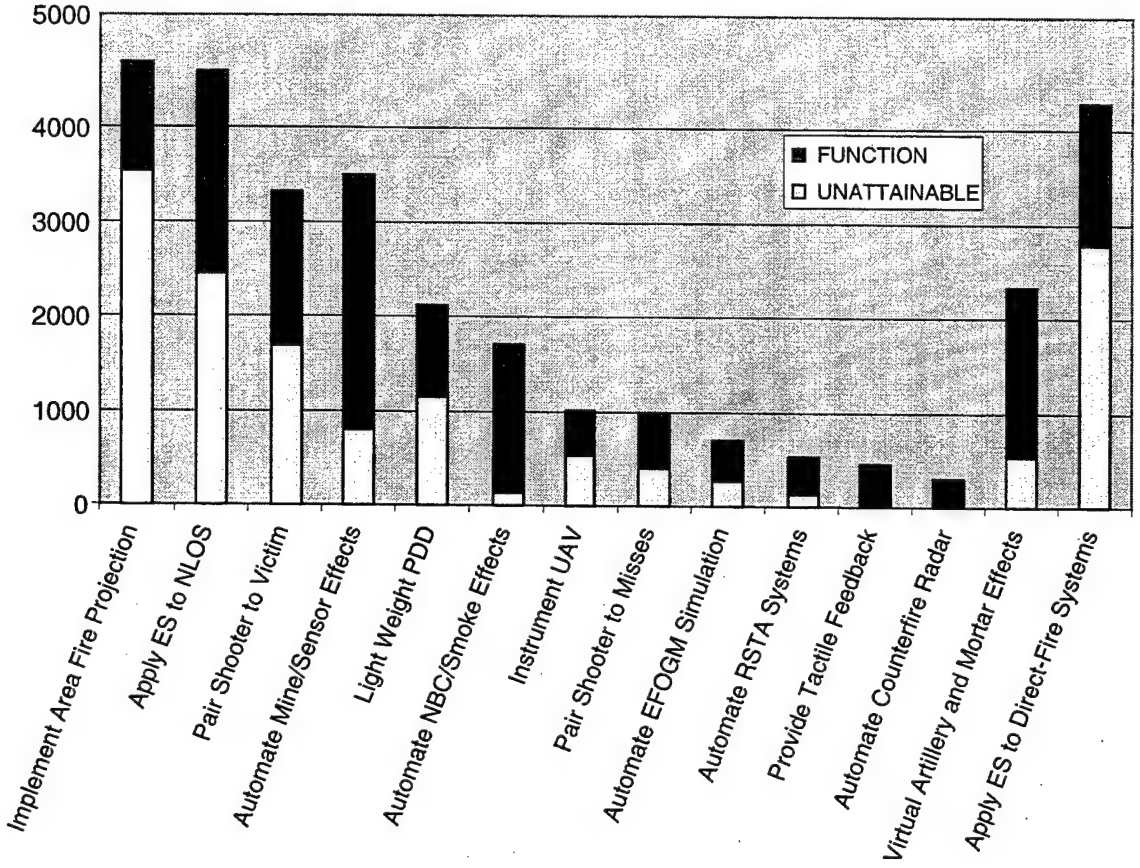


Figure 21. TES concept prioritization when safety and technical feasibility are considered.

Summary and Recommendations

This study confirmed that the live training environment cannot simulate or provide feedback on many existing and emerging tactical systems without major enhancements to TES and IS. The study determined that exercise control and data collection functions will overwhelm trainers for those systems the CTCs can simulate. Many CAF functions cannot reasonably be performed with the current TES and IS systems, even if trainers were provided with more time.

During an analysis of 155 tactical systems, this study derived and prioritized 228 trainer control and data collection functions to support simulation and AAR feedback requirements. This analysis also identified 96 critical feedback elements which are currently unattainable at the CTCs.

This study formulated and prioritized 15 high level TES concepts to overcome identified shortfalls. The top five TES concepts support 70 percent of the systems analyzed (109 of 155 systems). They will eliminate 59 percent of the functions performed by OC and TAF analysts and 75 percent of the intrinsic and extrinsic feedback deficiencies identified during the study.

We found that many of the TES concepts were able to support more than one type of weapon system (i.e., direct fire, NLOS, area weapons, and non-lethal) offering hope that future TES systems are likely to be less stovepiped in nature than are current systems. The current study did not attempt to analysis the extent to which the various high level TES concepts produce a TES/IS that is stovepiped in nature, because this is materiel development issue rather than a behavioral issue: however, the online database does support analyses of stovepipe issues.

In keeping with the long term research and studies plan developed by ATMD (Faber, 1996), it is time to build upon the ATESC study by examining the technical feasibility and costs of implementing various possible technical options for implementing the 15 TES/IS concepts described in the current report. The online database provides a "mark on the wall," describing challenges to be addressed

by future TES/IS and enabling comparative evaluations of the benefits gained by competing materiel development solutions.

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APPENDIX A - LIST OF ABBREVIATIONS AND ACRONYMNS

3D	3 Dimensional
A3RM	Advanced After Action Review Media
AAR	After Action Review
AD	Air Defense
ADA	Air Defense Artillery
AGES	Air-to-Ground Engagement System
ARI	Army Research Institute
ARTEP	Army Training and Evaluation Program
ASTMP	Army Science and Technology Master Plan
ATESC	Advanced Tactical Engagement Simulation Concept
ATSC	Army Training Support Center
BCIS	Battle Command Identification System
BDA	Battle Damage Assessment
Bde	Brigade
BIDS	Biological Integrated Detection System
BLUFOR	Friendly Forces
Bn	Battalion
BOS	Battlefield Operating System
C2	Command and Control
CAF	Control and Feedback
CAS	Close Air Support
Cdr/CDR	Commander
CGS	Common Ground Station
CIS	Core Instrumentation System
Cmd	Command
CMD	Command
CMTC	Combat Maneuver Training Center
COA	Course of Action
Co Tm	Company Team
COM	Change Of Mission
CS	Combat Support
CS	Tear Gas
CSS	Combat Service Support
CTC	Combat Training Center
CVC	Combat Vehicle Crew
CVKI	Combat Vehicle Kill Indicator
DA	Department of the Army
DCI	Digital Communications Interface
DIFCUE	Direct/Indirect-fire Cue
DoD	Department of Defense
DSSU	Dismounted Soldier System Unit
DTOC	Division Tactical Operation Center
EFOGM	Enhanced Fiber Optic Guided Missile
EMCC	Exercise Management and Control Cell
ES	Embedded Simulation

EXFOR	Experimental Force
FAAD GBS	Forward Area Air Defense Ground-Based Sensor
FDC	Fire Direction Center
FO	Forward Observer
FRAGO	Fragmentary Order
FS	Fire Support
FSO	Fire Support Officer
GBS/BADD	Global Broadcast System/Battlefield Awareness Data Dissemination
GCS	Ground Control Station
GSR	Ground Surveillance Radar
HAWM	Hierarchical Additive Weighting Method
HMMWV	High Mobility Multi-purpose Wheeled Vehicle
IBM	International Business Machines
ID	Infantry Division
ID	Identification
IFF	Identification Friend or Foe
IMF	Intelligent Minefield
INT	Intelligence
IS	Instrumentation System
JRTC	Joint Readiness Training Center
JSTARS	Joint Surveillance Attack Radar System
JTF	Joint Task Force
LAN	Local Area Network
LD	Line of Departure
LOGPAC	Logistics Package
LOS	Line Of Sight
LW PDD	Lightweight PDD
MANPRINT	Manpower and Personnel Integration
MCS	Maneuver Control System
MES	Mine Effects Simulator
MICAD	Multipurpose integrated Chemical Agent Alarm
MICLIC	Mine Clearing Line Charge
MILES	Multiple Integrated Laser Engagement System
MOPP	Mission-Orientation Protective Posture
MS	Mobility/Survivability
MTP	Mission Training Plan
MVR	Maneuver
MWDD	Man-Worn Detection Device
NAI	Named Area of Interest
NBC	Nuclear, Biological and Chemical
NCA	National Command Authority
NLOS	Non-Line-Of-Sight
NOD	Night Observation Device
NTC	National Training Center
OC	Observer/Controller
OCCS	Observer/Controller Communications System

OCSW	Objective Crew-Served Weapon
OI	Operations and Intelligence
OICW	Objective Individual Combat Weapon
OPFOR	Opposing Forces
OPORD	Operations Order
ORSMC	Off Road Smart Mine Clearance
PC	Personal Computer
PDD	Player Detection Devices
PGMM	Precision Guided Mortar Munition
Pk	Probability of Kill
Plt	Platoon
RCS	Remote Control Station
RF	Radio Frequency
RGB	AAR Aids
RSS	Radar Simulation System
RSTA	Reconnaissance, Surveillance and Target Acquisition
SAWE	Simulated Area Weapons Effects
SOP	Standard Operating Procedure
TAAF Aids	Training Analysis and Feedback Aids
TAF	Training Analysis Facility
TAI	Target Area of Interest
TC	Track Commander
TES	Tactical Engagement Simulation
TF XXI AWE	Task Force XXI Army Warfighting Experiment
TF	Task Force
THP	Take Home Package
TOC	Tactical Operations Center
TRADOC	US Army Training and Doctrine Command
TRP	Target Reference Point
UAV	Unmanned Aerial Vehicle
VDD	Vehicle Detection Device
VISMOD	Visually Modified
VTC	Video Teleconference
WAM	Wide Area Munitions
WIA	Wounded-In-Action

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APPENDIX C - REPRESENTATIVE SYSTEMS

1. The analysis supports 155 weapons and RSTA systems/technology demonstrations. As we analyzed the intrinsic and extrinsic feedback requirements of the weapons, and RSTA systems, we found our analysis of selected systems was applicable to other systems. For those systems where our analysis supported the control and feedback requirements of other tactical systems, we designated the analyzed system as a "representative system." The table in this appendix lists 27 representative systems and 112 other systems (munitions, tactical systems, or technology demonstrations) supported by our analysis of the representative systems.

When we could not extend the analysis of a system to other systems, we designated these systems "special cases." Appendix C identifies 16 special cases where our analysis is pertinent to only the analyzed system.

Our analyses of representative systems and special cases appear in the illustrations in Appendix D (Weapon and RSTA System Control and Feedback Analyses).

2. The table in this appendix addresses munitions, tactical systems and technology demonstrations using the following Battlefield Operating System categories:

AIR DEFENSE	AD
FIRE SUPPORT	FS
INTELLIGENCE	INT
MANEUVER	MVR
MOBILITY SURVIVABILITY	MS

BOS and Representative Systems	Systems and Technology Demonstrations Supported by Representative System Analysis
AIR DEFENSE BOS	
Avenger Air Defense System	2.75 - Inch Anti-Air TD Chaparral Electronic Integrated Sensor Suite for Air Defense (EISS-AD) TD High Mobility Ground Launched AIM-120 Advanced Medium Range Air to Air Missile (AMRAAM) TD (HMGL-AMRAAM) Linebacker Stinger Vulcan
FIRE SUPPORT BOS	
Crusader Howitzer	155mm Automated Howitzer (AH) TD 155mm Howitzer, Dual Purpose Improved Conventional Munition (DPICM) Advanced Extended Range Cargo Projectile (AERCAP) TD Autonomous Intelligent Submunition (AIS) TD Brilliant Anti-Armor Submunition (BAT) Guided Multiple Launch Rocket System (MLRS) ATD High Mobility Artillery Rocket System (HIMARS) TD Indirect Precision Fire (IPF) ATD M198, M102, M119, Towed Howitzer Multiple Launch Rocket System (MLRS) Paladin Howitzer Rocket Assisted Projectile (RAP) Self-Propelled Howitzer M109A1, A2, A3, A4, A5 Target Defeat Capability TD
Enhanced Fiber Optic Guided Missile (EFOGM)	Multimode Airframe Technology (MAT) TD (LONGFOG)
Precision Guided Mortar Munition (PGMM)	105mm Terminally Guided Projectile TD 155mm Howitzer, M712 Copperhead Projectile

BOS and Representative Systems	Systems and Technology Demonstrations Supported by Representative System Analysis
FIRE SUPPORT BOS (CONT.) **SPECIAL CASES** **155mm Howitzer, Field Artillery Scatterable Minefield (FASCAM) Projectile** **155mm Howitzer, Search and Destroy Armor (SADARM) Projectile**	
INTELLIGENCE BOS **FAAD Ground Based Sensor**	Ground Based Common Sensor Ground Based Sensor
Firefinder Q36 Radar	Firefinder Q37 Radar Bistatic Radar System
Ground Surveillance Radar AN/PPS-5	Ground Surveillance Radar AN/PPS-15 Moving Target Locating Radar (MTLR) AN/TPS-25A Moving Target Locating Radar (MTLR) AN/TPS-58B
Hunter Sensor Suite	Future Scout and Cavalry System (FSCS) ATD Light and Special Division Interim Sensor (LSDIS) Long Range Advanced Scout Surveillance System (LRAS3) Target Acquisition ATD Multifunction Staring Sensor Suite ATD
Maneuver UAV	Aerial Scout Sensor Integration TD Hunter UAV Machine Vision for Autonomous Unmanned Ground Vehicle (UGV) TD Masked Targeting TD Multimission/Common Modular UAV Sensors ORION Synthetic Aperture Radar (SAR) Target Recognition and Location System (STARLOS)
INTELLIGENCE BOS	

BOS and Representative Systems	Systems and Technology Demonstrations Supported by Representative System Analysis
(CONT.) **Remotely Monitored Battlefield Sensor System (REMBASS)** **SPECIAL CASES** **Bird Dog UAV**	Improved REMBASS (IREMBASS)
MANEUVER BOS **12- Gauge Round (Bean Bag) TD** **Abrams Tank, Main Gun** **Apache,AH-64A HELLFIRE Missile**	12- Gauge Round (Rubber Ball) TD Mid-Sized Riot Control Dispenser TD Abrams Tank, M2 .50 Cal Machine Gun Abrams Tank, M240 7.62 Coaxial Machine Gun Bradley Fighting Vehicle 25mm Cannon Direct Fire Lethality ATD Future Combat System (FCS) Future Infantry Fighting Vehicle (FIFV) Kinetic Energy Tungsten Core (KE-T) Round Line of Sight Anti-Tank (LOSAT) ACTD M829 Armor Piercing, Fin Stabilized, Discarding Sabot, Tracer (APFSDS-T) Round M830A1 High Explosive Anti-Tank Multipurpose (HEAT-MP-T) Round AH-64D Longbow Apache Helicopter, HELLFIRE Missile Brilliant Helicopter Advanced Weapons (BHAW) TD Apache AH-64A and AH-64D Longbow Apache Helicopter, HELLFIRE II Missile Apache AH-64A and AH-64D Longbow Apache Helicopter, M230 30mm Chain Gun Kiowa OH-58D and RAH-66 Comanche Helicopter, HELLFIRE Missile Kiowa OH-58D and RAH-66 Comanche Helicopter, HELLFIRE II Missile Low Cost Precision Kill (LCPK) (ATG/GTG) 2.75- Inch Guided Rocket TD RAH-66 Comanche Helicopter, 20mm Chain Gun

BOS and Representative Systems	Systems and Technology Demonstrations Supported by Representative System Analysis
MANEUVER BOS (CONT.)	
Battlefield Combat Identification (BCID) ATD	Battlefield Combat Identification System (BCIS)
	Advanced Manportable Sensors for the Dismounted Warrior
Land Warrior System	
Longbow Apache AH-64D LONGBOW HELLFIRE	Air/Land Enhanced Reconnaissance and Targeting (ALERT) ATD Future Missile Technology Integration (FMTI) RAH-66 Comanche LONGBOW HELLFIRE Missile
Multispectral Countermeasures (MSCM) ATD	Full Spectrum Threat Protection TD Integrated Situational Awareness and Countermeasures (ISCAM) TD
Non-Lethal Entanglement TD	Electric Vehicle Stopper TD Non-Lethal Marker Munition TD
Objective Individual Combat Weapon (OICW) ATD	Integrated Sight (IS) TD Javelin, Anti-Tank Weapon M136 Light Anti-Tank Weapon (AT4) M16A2 Rifle M18A1 Claymore Mine M203 Grenade Launcher M240 Squad Automatic Weapon (SAW) M47 Medium Anti-Tank Weapon (Dragon) M72 Light Anti-Tank Weapon (LAW) Multipurpose Individual Munition/SRAW (MPIM/SRAW) TD Objective Personal Weapon (OPW) TD Objective Sniper Weapon (OSW) TD
MANEUVER BOS (CONT.)	

BOS and Representative Systems	Systems and Technology Demonstrations Supported by Representative System Analysis
SPECIAL CASES	
Bayonet	
Combustion engine Defeat Mechanism TD	
Compact Kinetic Energy Missile TD	
Ground Vehicle Distributed Defense TD	
Hit Avoidance ATD	
HYDRA-70 Rocket System	
MK-19 40mm Grenade Machine Gun	
Objective Crew Served Weapon	
Rotorcraft Air Combat Enhancement (RACE)	
Tank Extended Range Munition (TERM)	
MOBILITY SURVIVABILITY BOS	
Aqueous Foam Barrier	Field Expedient Foam

BOS and Representative Systems	Systems and Technology Demonstrations Supported by Representative System Analysis
Biological Integrated Detection System (BIDS)	M93A1 FOX Nuclear Biological Chemical Reconnaissance System Biological Remote Early Warning Advanced Concept TD Integrated Biodetection TD
Grizzly	M58 Mine Clearing Line Charge (MICLIC) Wolverine
Joint Service General Purpose Mask (JSGPM)	Joint Service Aviation Mask (JSAM)
Multipurpose Integrated Chemical Agent Alarm (MICAD)	Chemical Imaging Sensor Demonstration TD Joint Chemical Agent Detector Joint Warning and Reporting Network Liquid Surface Detection TD
Off Road Smart Mine Clearance	Joint Countermine Advanced Concept Technology Demonstration (CM ACTD) Lightweight Airborne Multispectral Countermine Detection System TD Mine Hunter Killer ATD Panther Robotic Countermine Vehicle (ROC-V) Vehicular Mounted Mine Detector ATD

BOS and Representative Systems	Systems and Technology Demonstrations Supported by Representative System Analysis
MOBILITY SURVIVABILITY BOS (CONT.)	
RAPTOR Intelligent Combat Outpost	Anti-Personnel Mine M14 Anti-Personnel Mine M16A1 Anti-Tank Mine M21 Hand Emplaced Wide Area Munition (WAM) M93 Intelligent Minefield (IMF) ATD
Smoke Generator M56	Mechanized Smoke Generator M58 Millimeter Wave Screening Multispectral Smoke
Volcano Multiple Delivery Mine System	Ground Emplaced Mine Scattering System (GEMMS) Modular Pack Mine Systems (MOPMS)
SPECIAL CASES	
Electric Water Cannon TD	
Integrated Acoustic System (IAS)	

APPENDIX D - WEAPONS and RSTA SYSTEMS

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FIREFINDER Radar System D-32
Ground Surveillance Radar System D-36
Hunter Sensor Suite D-40
Maneuver Unmanned Aerial Vehicle (UAV) D-44
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Combustion Engine Defeat Mechanism D-106
Compact Kinetic Energy Missile D-110
Ground Vehicle Distributed Defense D-114
Hit Avoidance D-118
Rotorcraft Air Combat Enhancement (RACE) D-122
Tank Extended Range Munition (TERM) D-126

APPENDIX D - WEAPONS and RSTA SYSTEMS

Aqueous Foam Barrier (Non-Lethal) D-130
Biological Integrated Detection System (BIDS) D-134
Grizzly D-138
Joint Service General Purpose Mask (JSGPM) D-142
Multi-Purpose Integrated Chemical Agent Alarm (MICAD) D-146
Off Route Smart Mine Clearance System D-150
RAPTOR-Intelligent Combat Outpost D-155
M56 Smoke Generator D-159
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Volcano Multiple Delivery Mine System (Air Emplaced) D-167
Electric Water Cannon (Non-Lethal) D-171
Integrated Acoustic System (IAS) D-175

As we analyzed the intrinsic and extrinsic feedback requirements of weapons, and RSTA systems, we found our analysis of selected systems was applicable to other systems. For those systems where our analysis supported the controls and feedback requirements of other tactical systems, we designate the analyzed system as a "representative system." Appendix C lists 27 representative systems and 112 other systems (munitions, tactical systems, or technology demonstrations) supported by our analysis of the representative systems.

When we could not extend the analysis of a system to other systems, we designated these systems, "special cases." Appendix C identifies 16 special cases where our analysis is pertinent only to the analyzed system. The analysis supports 155 systems/technical demonstrations.

Our analysis of representative systems and special cases for Weapons and RSTA systems appear in the illustrations in this appendix. There are four types of one or more illustrations for each system. The first type of illustration, Intrinsic Feedback, identifies the "downrange" intrinsic feedback required during the exercise as players interact with their tactical systems and other players. Intrinsic feedback consists of those real or simulated entities or activities that simulate the senses of the players (sight, sound, smell, feel, and taste) and causes the to react to a condition or combination of conditions. In our analysis, we identified not only the intrinsic feedback required, but also the source of the feedback. Each Intrinsic Feedback illustration contains a legend (Figure C-1) which identifies the feedback source.

P -- Actual feedback obtained by the players from hands-on interaction
with their tactical equipment or other players

T -- Simulated feedback provided by the TES

O -- Simulated feedback provided by OCs and TAF analysts (includes firemarkers)

N -- No feedback provided

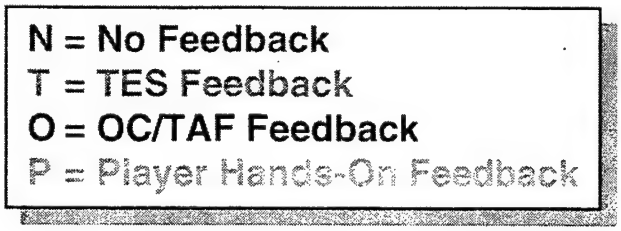


Figure D-1. Intrinsic Feedback Legend

The second type of illustration, Intrinsic Feedback Tasks, identifies the OC or TAF analyst tasks required to provide "downrange" control actions to satisfy the "O" items shown on the Intrinsic Feedback illustrations.

The third type of illustration, Extrinsic Feedback, identifies the feedback provided to the BLUFOR in the form of AARs, coaching, THPs. Our analysis of extrinsic feedback also identified feedback requirements and the source of the feedback. Each Extrinsic Feedback illustration in the appendix contains a legend (Figure D-2) which identifies the feedback source.

I -- Data collected by the instrumentation system

O -- Data collected by OCs or TAF analysts

N -- Data not collected

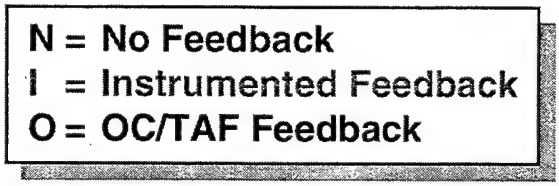
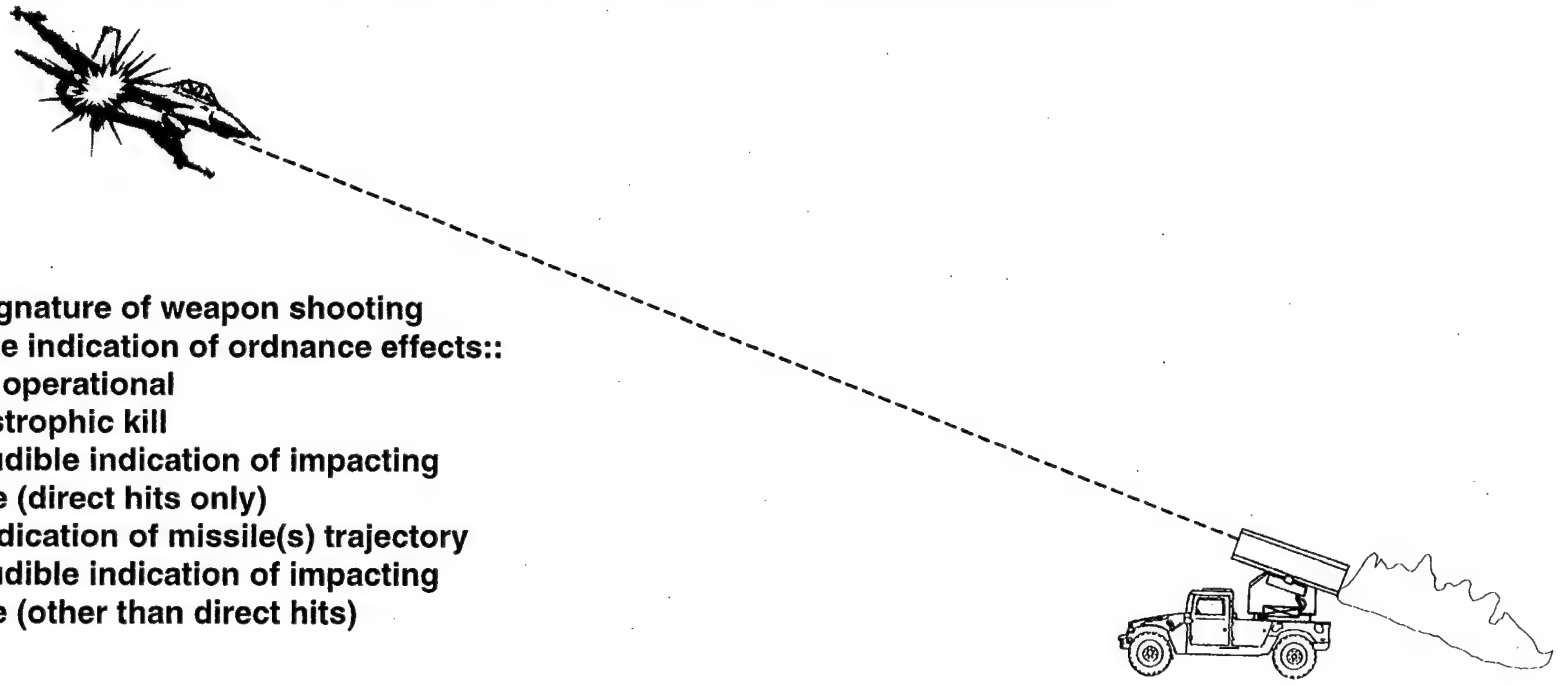


Figure D-2. Extrinsic Feedback Legend

The final type of illustration, Extrinsic Feedback Tasks, identifies OC and TAF analyst tasks required to capture the extrinsic data identified as "O" items on the Extrinsic Feedback illustrations.

Intrinsic Feedback: Avenger Air Defense System (LOS) Fixed Wing



O - Visual signature of weapon shooting
Visual/audible indication of ordnance effects::
- O - Fully operational
- O - Catastrophic kill

N - Visual/audible indication of impacting ordnance (direct hits only)
N - Visual indication of missile(s) trajectory
N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
O - Visual/audible signature when weapon fires
Visual indication of ordnance effects:
- O - Combat effective
- O - Out of action

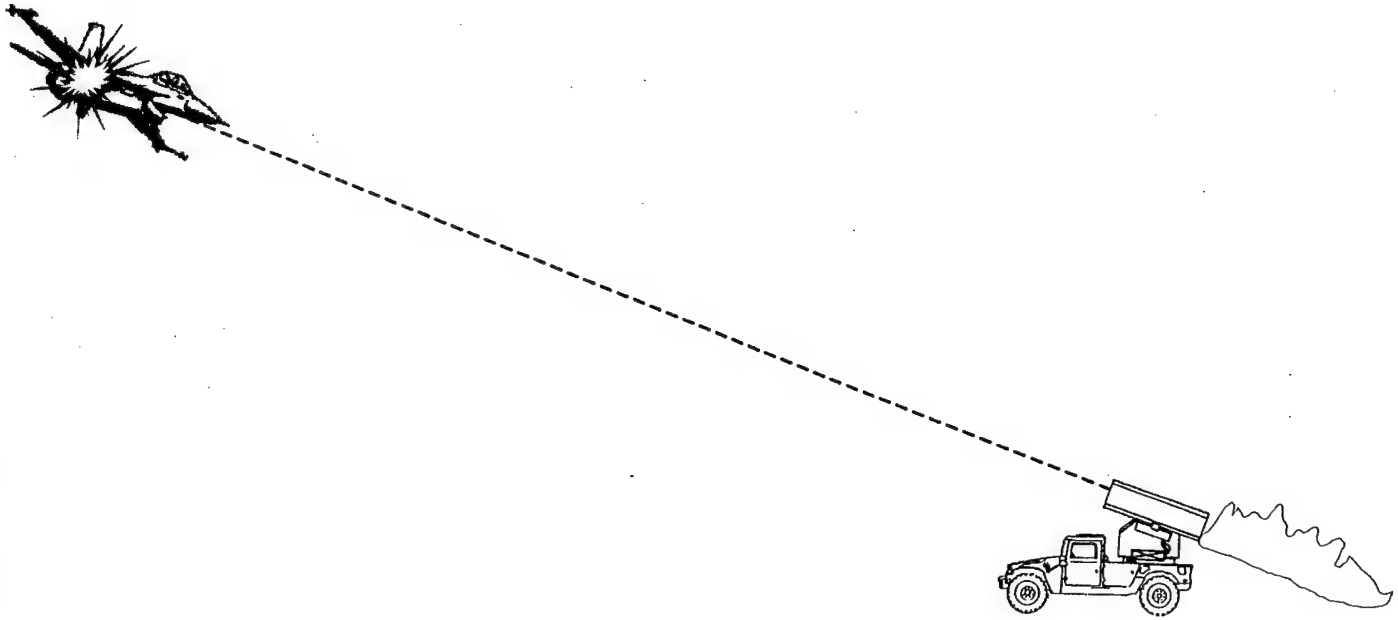
N - Location of impacting ordnance (direct hits only)
N - Visual indication of missile(s) trajectory
N - Location of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Avenger Air Defense System (LOS) Fixed Wing

TAF Analyst

1. Receive information from OC on number of Avenger shots taken during engagement
2. Compile total Avenger shots taken from all OC's and provide information to DTOC counterpart for casualty assessment
3. When casualty assessment complete inform appropriate OC of Victim ID, Location, and Victim status for engagement results



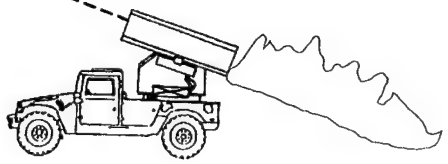
OC

1. When Avenger ATWESS fires, shoot white star cluster to produce highly visible signature
2. Monitor Avenger ID, Location and number of Avenger shots taken at fixed wing aircraft for each Avenger
3. Report number of Avenger shots taken to TAF analyst
4. Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, and MILES limitations)

Extrinsic Feedback: Avenger Air Defense System (LOS) Fixed Wing

O - Victim ID
O - Victim location
Victim status:
- O - Fully operational
- O - Catastrophic kill
- N - Type combat damage

N - Hit/Kill aspect angle
N - Kill code



O - Shooter ID
O - Shooter location
O - Vector pairing of shooter to victim
N - Ammunition type and amount fired
N - Ammunition type and amount on hand
N - Pairing of shooter to misses
N - Location of shooter and victim when inter-visible and exposure time

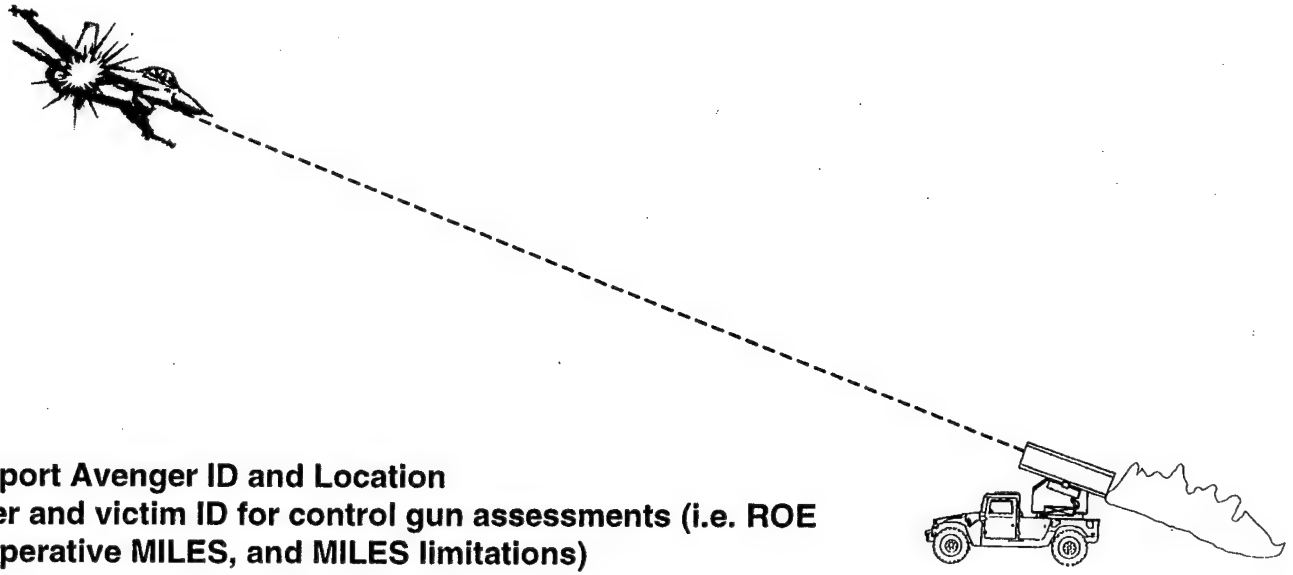
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Avenger Air Defense System (LOS) Fixed Wing

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

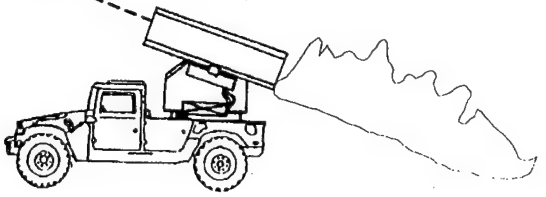
1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Draw vector from Avenger to fixed wing aircraft
7. Prepare a top down view AAR aid of engagement
8. Title the AAR aid to provide context and significance
9. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
10. Title the chart to provide context and significance
11. Store aids in the AAR bin
12. Time tag voice communications as appropriate



OC

1. Record and report Avenger ID and Location
2. Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, and MILES limitations)

Intrinsic Feedback: Avenger Air Defense System (LOS) Rotary Wing



O - Visual signature of weapon shooting
T - Out of action for MILES engagements
O - Out of action for control gun assessments
Visual/audible indication of ordnance effects:
- T - Fully operational
- T - Catastrophic kill
- P - Precautionary landing
- P - Emergency landing

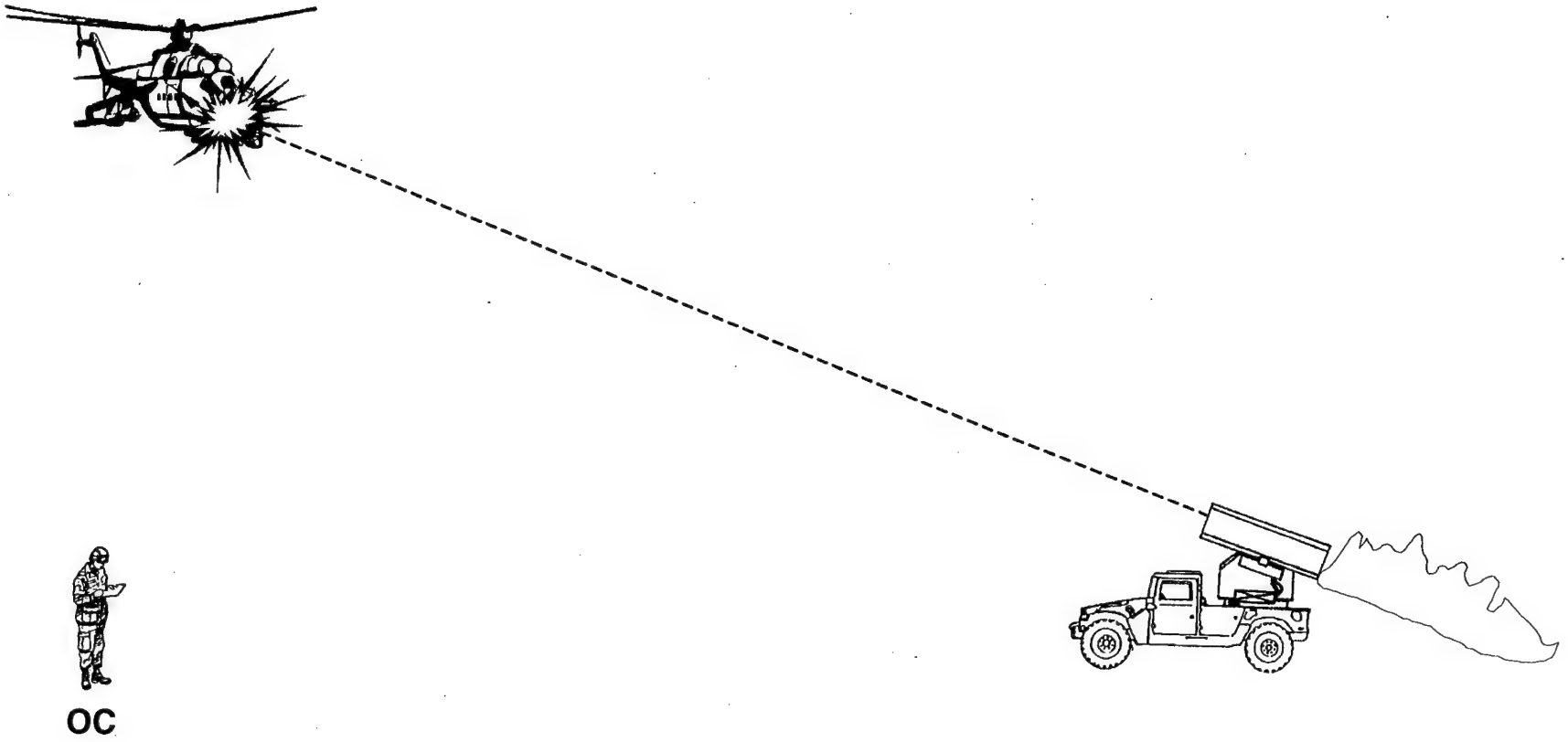
N - Visual indication of missile(s) trajectory
N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
T - Location of impacting ordnance (direct hits only)
O - Visual/audible signature when weapon fires
Visual indication of ordnance effects:
- P - Combat effective
- P - Out of action

N - Location of impacting ordnance (other than direct hits)
N - Visual indication of missile(s) trajectory

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Avenger Air Defense System (LOS) Rotary Wing

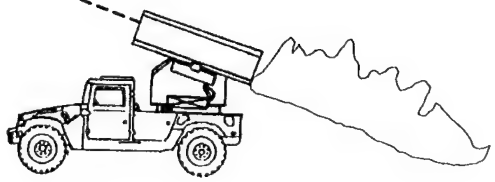


OC

1. When Avenger ATWESS fires, shoot white star cluster to produce highly visible signature
2. Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, and MILES limitations)

Extrinsic Feedback: Avenger Air Defense System (LOS) Rotary Wing

I - Victim ID
I - Victim location
I - Hit/Kill aspect angle
Victim status:
I - Fully operational
I - Catastrophic kill
O - Type combat damage
O - Hit/Kill aspect angle
O - Kill code



I - Shooter ID
I - Shooter location
I - Weapon ranging capability
O - Pairing of shooter to victim for control gun assessments
N - Vector pairing of shooter to victim
N - Ammunition type and amount fired
N - Ammunition type and amount on hand
N - Pairing of shooter to misses
N - Location of shooter and victim when inter-visible and exposure time

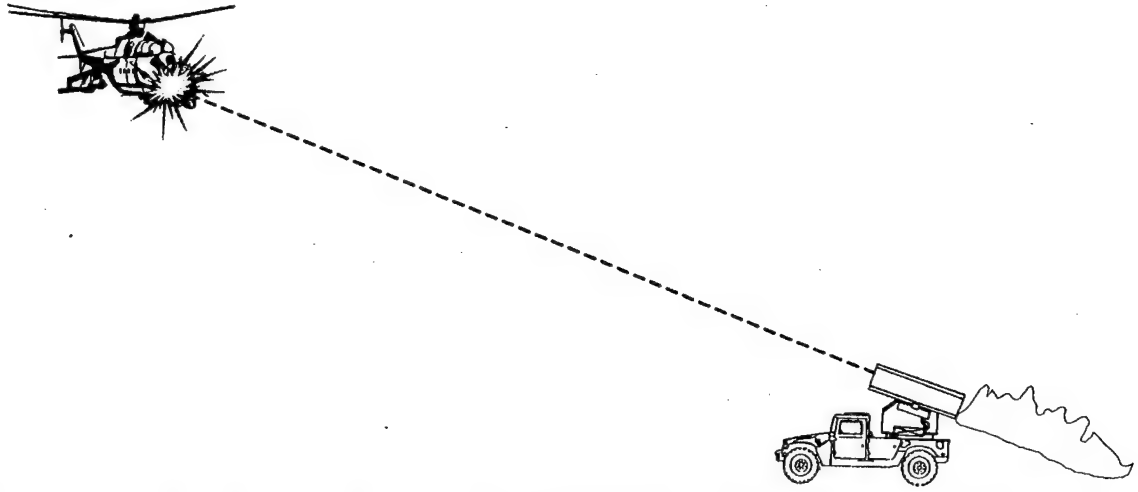
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Avenger Air Defense System (LOS) Rotary Wing

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in the AAR bin
11. Time tag voice communications as appropriate



OC

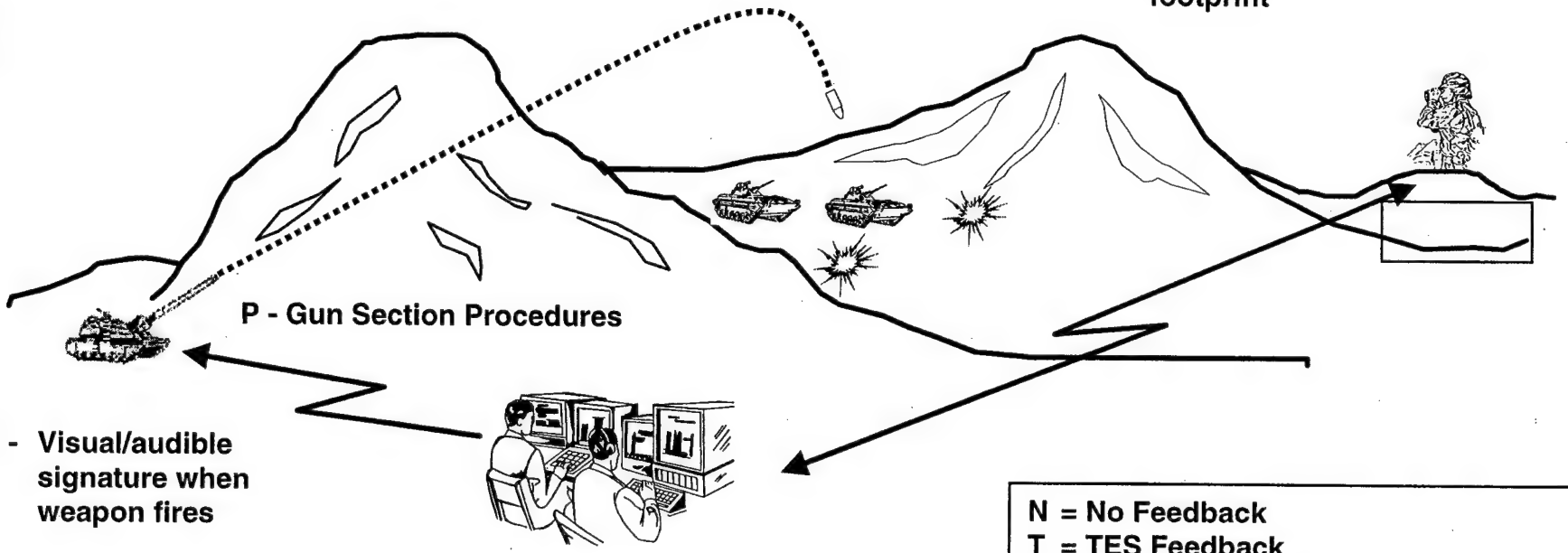
1. Obtain and record "kill codes," Hit/Kill aspect angle, and type combat damage for BLUFOR victims
2. Obtain and record "kill codes" for OPFOR victims
3. Record shooter and victim ID for control gun assessments (I.e. ROE violations, inoperative MILES, and MILES limitations)

Intrinsic Feedback: Crusader Howitzer (NLOS)

O - Visual/audible indication of impacting ordnance (may not be timely)
Visual/audible indication of ordnance effects:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Firepower kill
- O - Communications kill
- O - Type combat damage

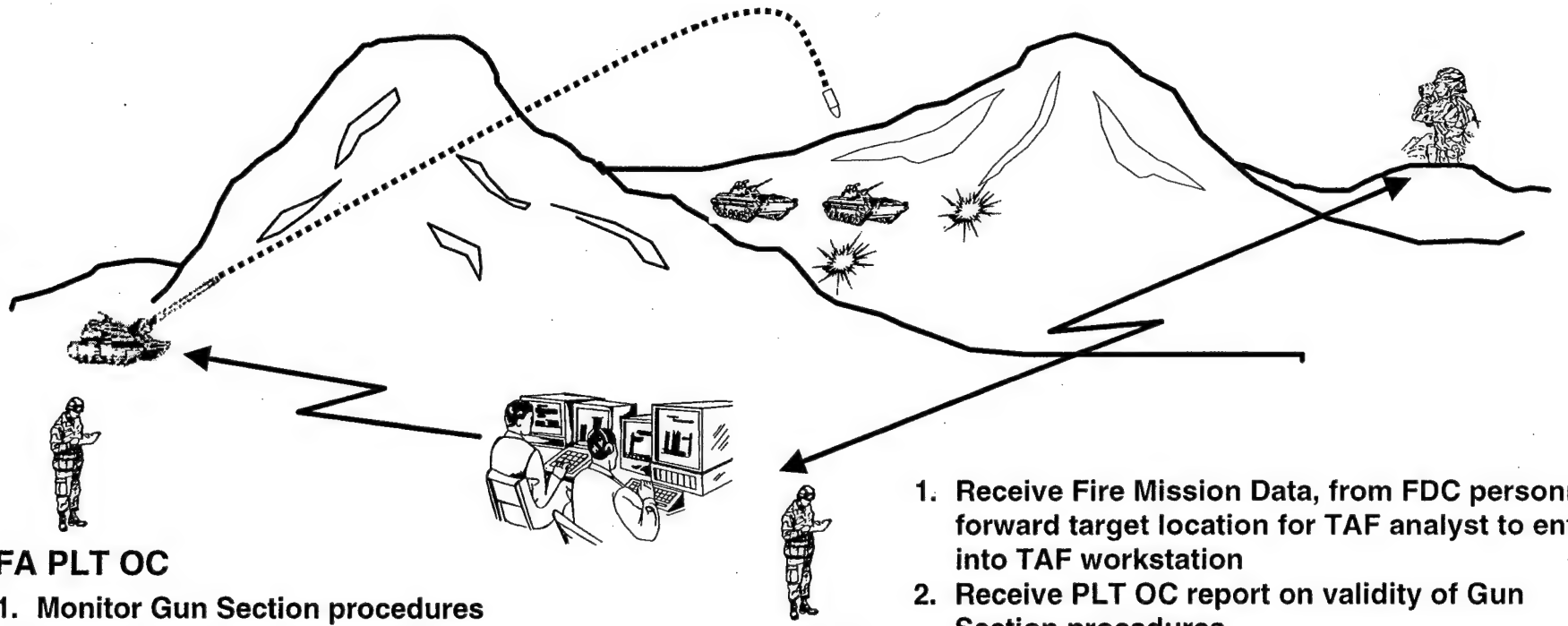
P - Visual means to ID friendly and enemy
P - Call for Fire Procedures
O - Location of impacting ordnance (may not be timely)
Visual indication of ordnance effects:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Firepower kill

N - Visual indication of engagement footprint



N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Crusader Howitzer (NLOS)



FA PLT OC

1. Monitor Gun Section procedures
2. If ammunition on hand and Gun section procedures valid inform FDC OC

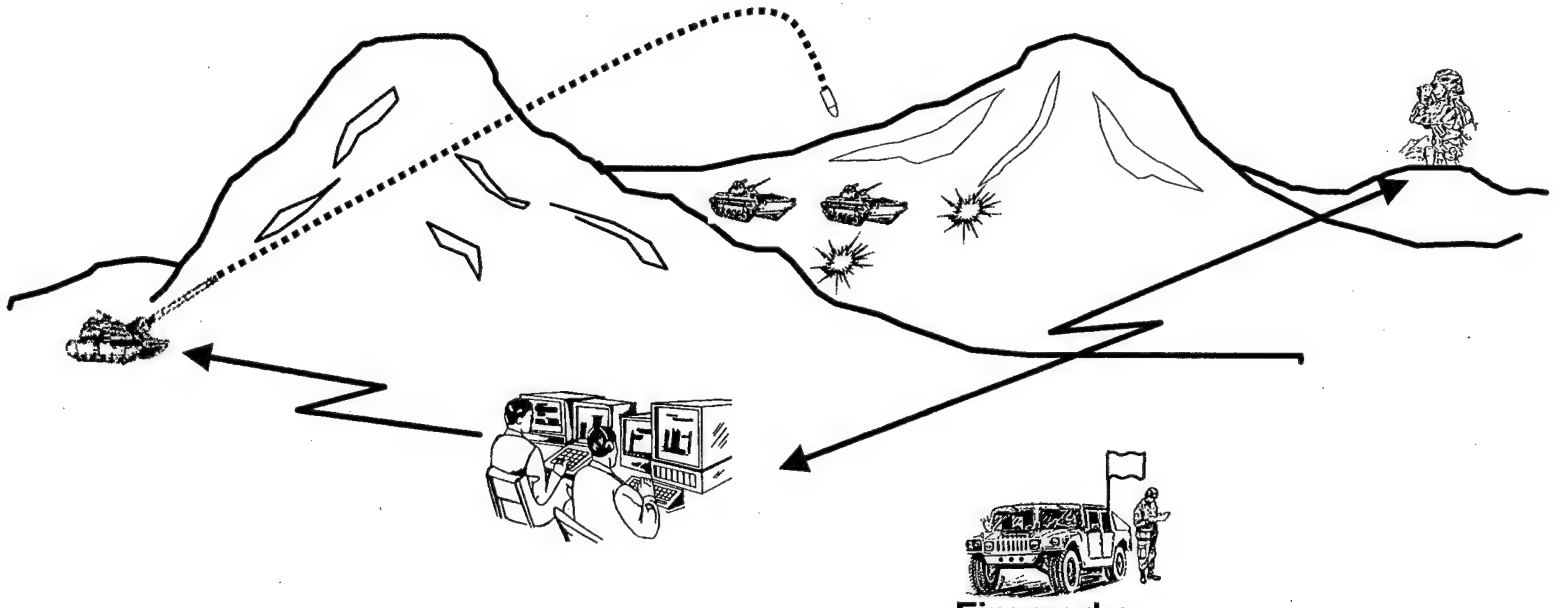
FDC OC

1. Receive Fire Mission Data, from FDC personnel, forward target location for TAF analyst to enter into TAF workstation
2. Receive PLT OC report on validity of Gun Section procedures
3. If FDC, and Gun section procedures valid tell TAF analyst to fire mission

Intrinsic Feedback Functions: Crusader Howitzer (NLOS)

TAF Analyst

1. Receive fire mission data from FDC OC and enter it into TAF workstation
2. When directed by the OC, fire the mission to provide graphical depiction of engagement footprint
3. If fires fall within 1,000 meters of BLUFOR forces, notify OC to mark location of impacting ordnance
4. If fires are beyond 1,000 meters from BLUFOR, notify nearest firemarker to mark location of impacting ordnance
5. If fires fall on OPFOR notify nearest firemarker to mark location of impacting ordnance
6. If fires are smoke or illumination missions, locate the nearest fire marker to mark fires



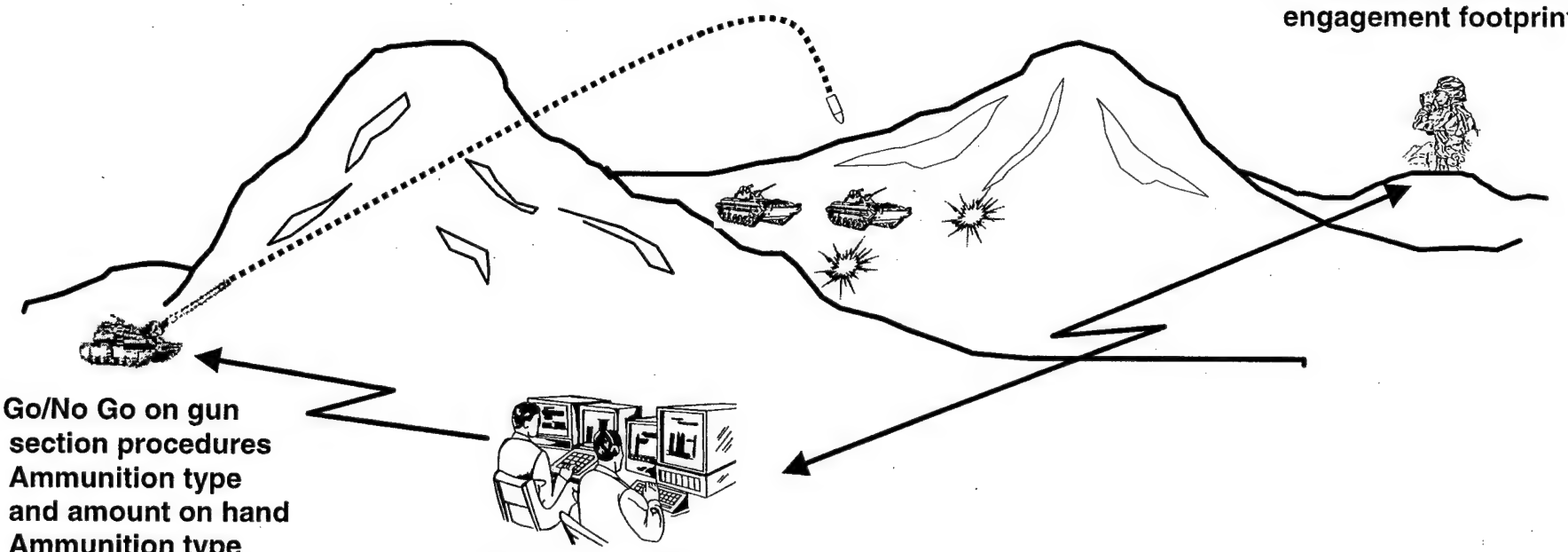
Firemarker

1. Receive location, volume, and type ordnance to mark from TAF analyst
2. Navigate to location of impacting ordnance
3. Mark fires with air and ground burst simulators, smoke, or flares as directed by the TAF
4. Notify TAF analyst when fires marked

Extrinsic Feedback: Crusader Howitzer (NLOS)

O - Victim ID
O - Victim location
Victim status:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Firepower kill
- O - Communications kill
- O - Type combat damage

O - Observer ID
O - Observer location
O - Data in Call for Fire
O - Go/No Go on FO/COLT procedures
O - Graphical depiction of engagement footprint



O - Go/No Go on gun section procedures
O - Ammunition type and amount on hand
O - Ammunition type and amount fired

O - Shooter ID
O - Shooter location
O - Go/No Go on FDC procedures
N - Pairing of shooter to MISSES

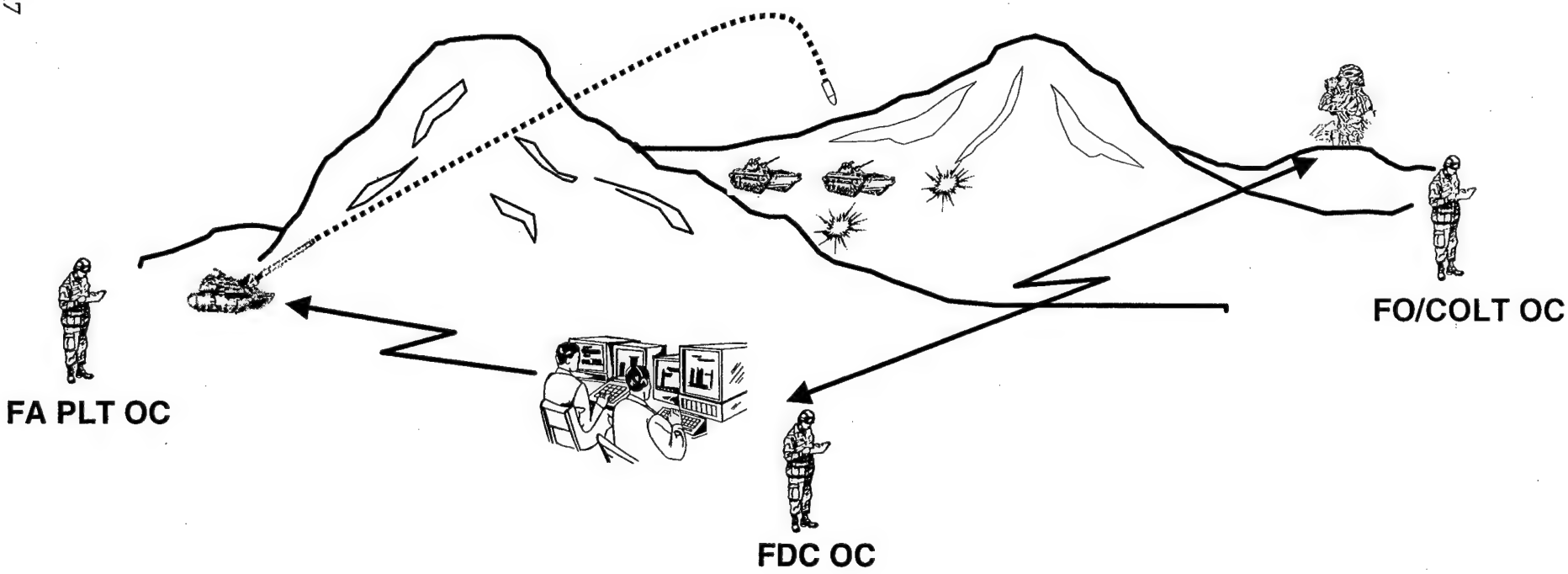
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Crusader Howitzer (NLOS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

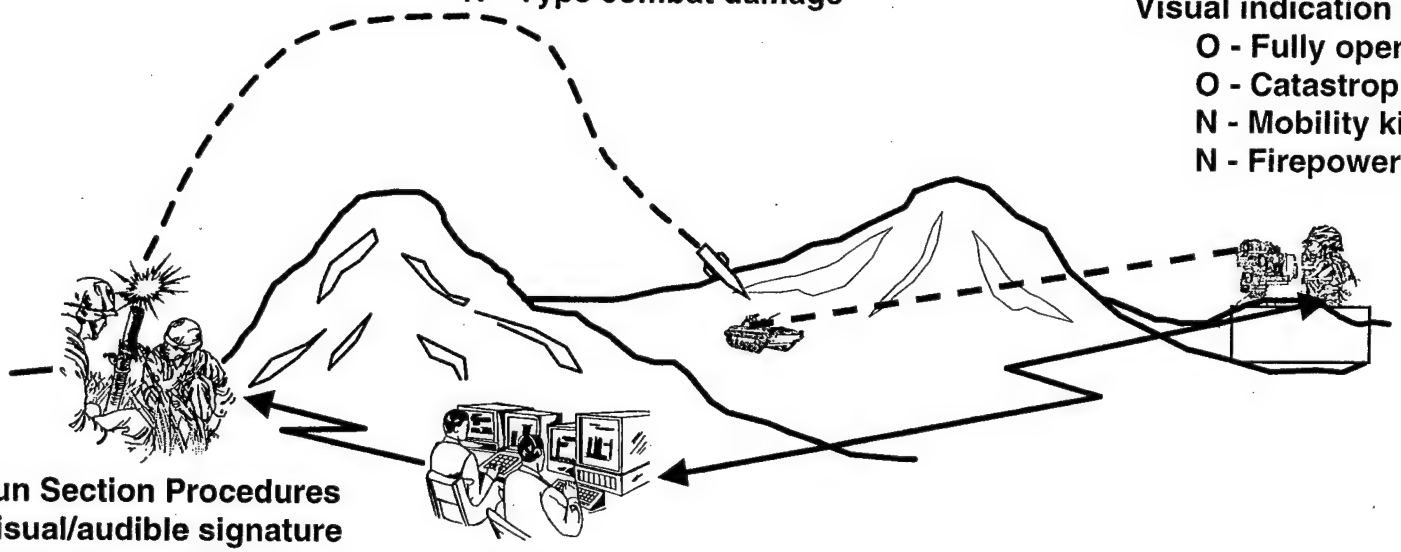
1. **Locate required weapon engagement in exercise history**
2. **Pan the map to the engagement area**
3. **Scale/zoom the map to display the engagement**
4. **Identify and display appropriate BLUFOR control measures**
5. **Prepare a top down view AAR aid of the engagement**
6. **Title the AAR aid to provide context and significance**
7. **Prepare statistical chart showing indirect-fire results**
8. **Title the chart to provide context and significance**
9. **Store aids in AAR bin**
10. **Time tag voice communications as appropriate**



Intrinsic Feedback: 120MM Precision Guided Mortar Munition (PGMM)

O - Visual/audible indication of impacting ordnance (direct hits only)
Visual/audible indication of ordnance effects:
- O - Fully operational
- O - Catastrophic kill
- N - Mobility kill
- N - Firepower kill
- N - Communications kill
- N - Type combat damage

P - Visual means to ID friendly and enemy
P - Call for Fire Procedures
P - Laser designation capability
O - Location of impacting ordnance (may not be timely)
Visual indication of ordnance effects:
- O - Fully operational
- O - Catastrophic kill
- N - Mobility kill
- N - Firepower kill

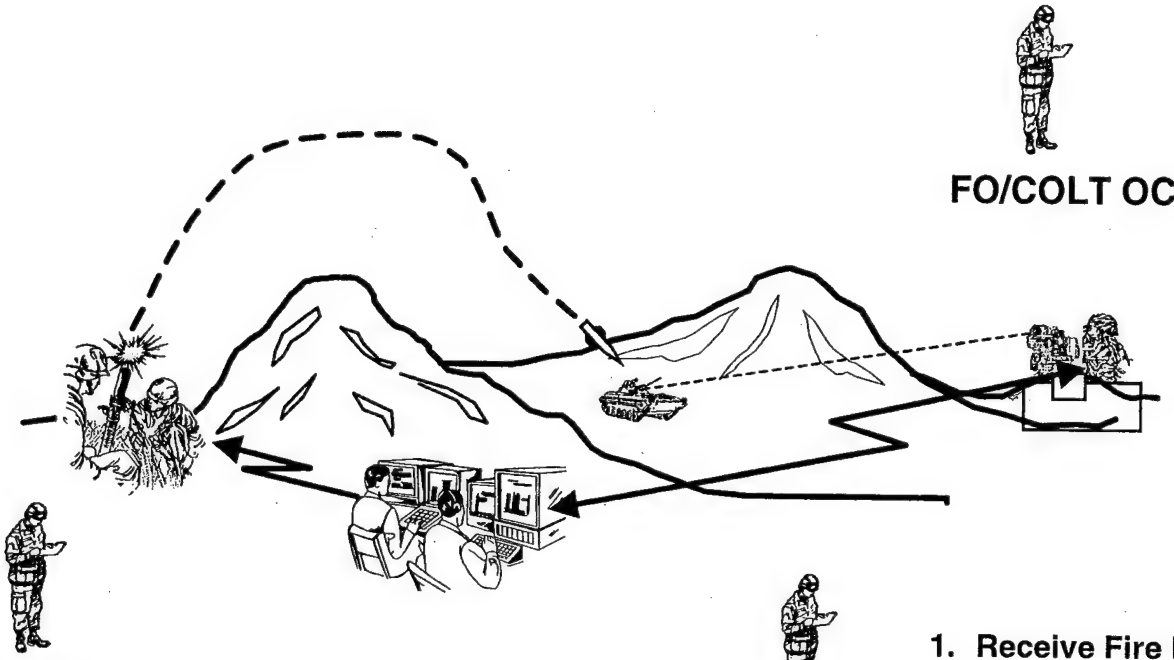


P - Gun Section Procedures
T - Visual/audible signature when weapon fires

P - FDC Procedures

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: 120MM Precision Guided Mortar Munition (PGMM)



FO/COLT OC

1. Monitor observer Call for Fire procedures
2. Assess Call for Fire and Laser designation procedures
3. If procedures valid call TAF to notify OC closest to victim(s), and tell them to administratively kill vehicle(s) depending on number of rounds fired

PLT OC

1. Monitor Gun Section procedures
2. If ammunition on hand and Gun section procedures valid inform FDC OC

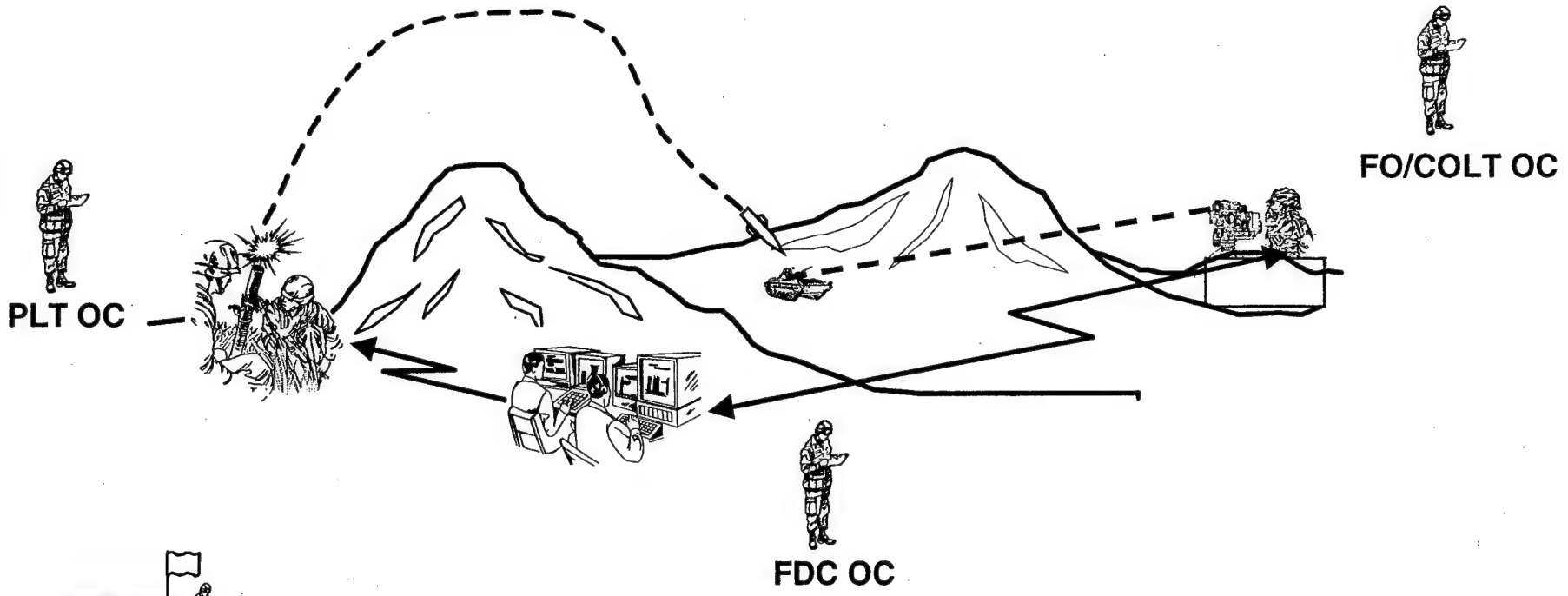
FDC OC

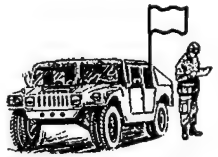
1. Receive Fire Mission Data, from FDC personnel, forward target location for TAF analyst to enter into TAF workstation
2. Receive PLT OC report on validity of Gun Section procedures
3. Coordinate with FO/COLT OC on validity of FO procedures
4. If FO/COLT, FDC, and Gun section procedures valid tell TAF analyst to fire mission

Intrinsic Feedback Functions: 120MM Precision Guided Mortar Munition (PGMM)

TAF Analyst

1. Receive fire mission data from FDC OC and enter it into TAF workstation
2. When directed by OC, fire the mission to provide graphical depiction of engagement footprint
3. Upon request of FO/COLT OC, notify OC closest to victim(s) and direct them to administratively kill player entities.
4. IF an OC is unable to kill the player entities, administratively kill player unit(s) from the TAF

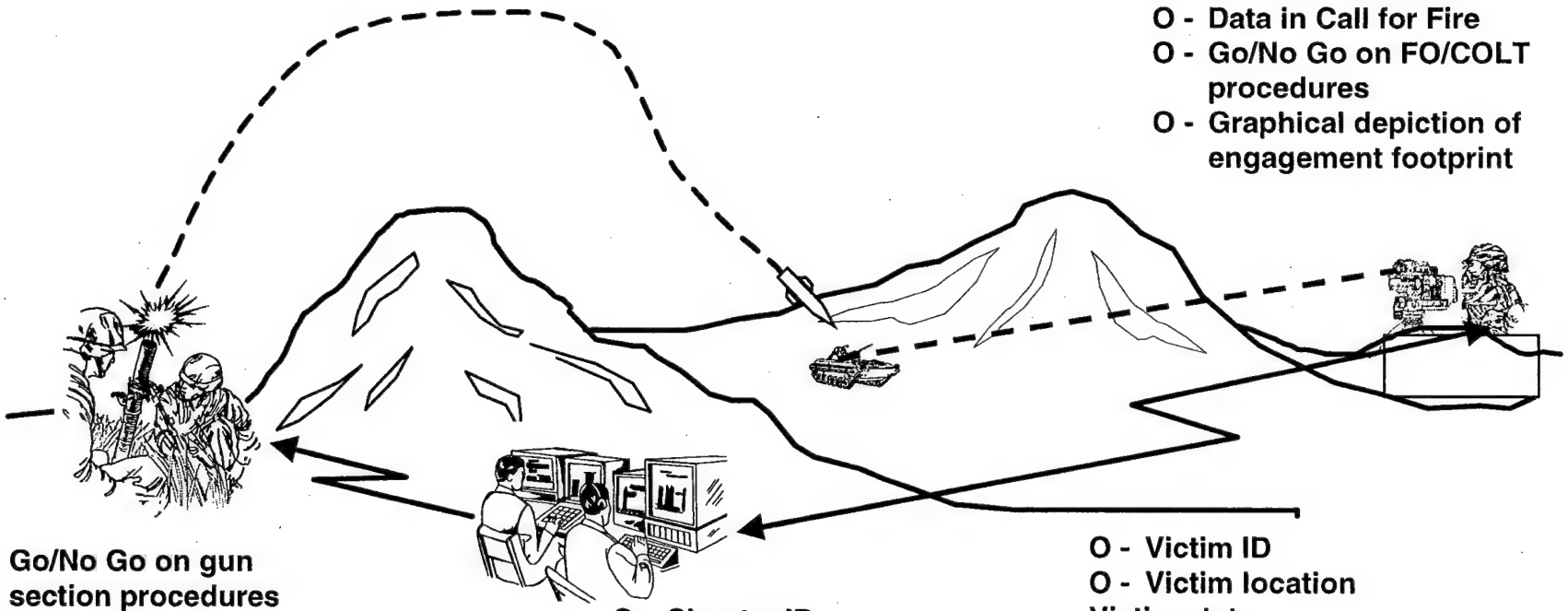




Firemarker

1. Receive location, volume, and type ordnance to mark form TAF analyst
2. Navigate to location of impacting ordnance
3. Mark fires with ground burst simulators as directed by the TAF
4. Notify TAF analyst when fires marked

Extrinsic Feedback: 120MM Precision Guided Mortar Munition (PGMM)



O - Observer ID
O - Observer location
O - Data in Call for Fire
O - Go/No Go on FO/COLT procedures
O - Graphical depiction of engagement footprint

O - Go/No Go on gun section procedures
O - Ammunition type and amount on hand
O - Ammunition type and amount fired

O - Shooter ID
O - Shooter location
O - Go/No Go on FDC procedures
N - Pairing of shooter to MISSES

O - Victim ID
O - Victim location
Victim status:
- O - Fully operational
- O - Catastrophic kill
- N - Mobility kill
- N - Firepower kill
- N - Communications kill
- N - Type combat damage

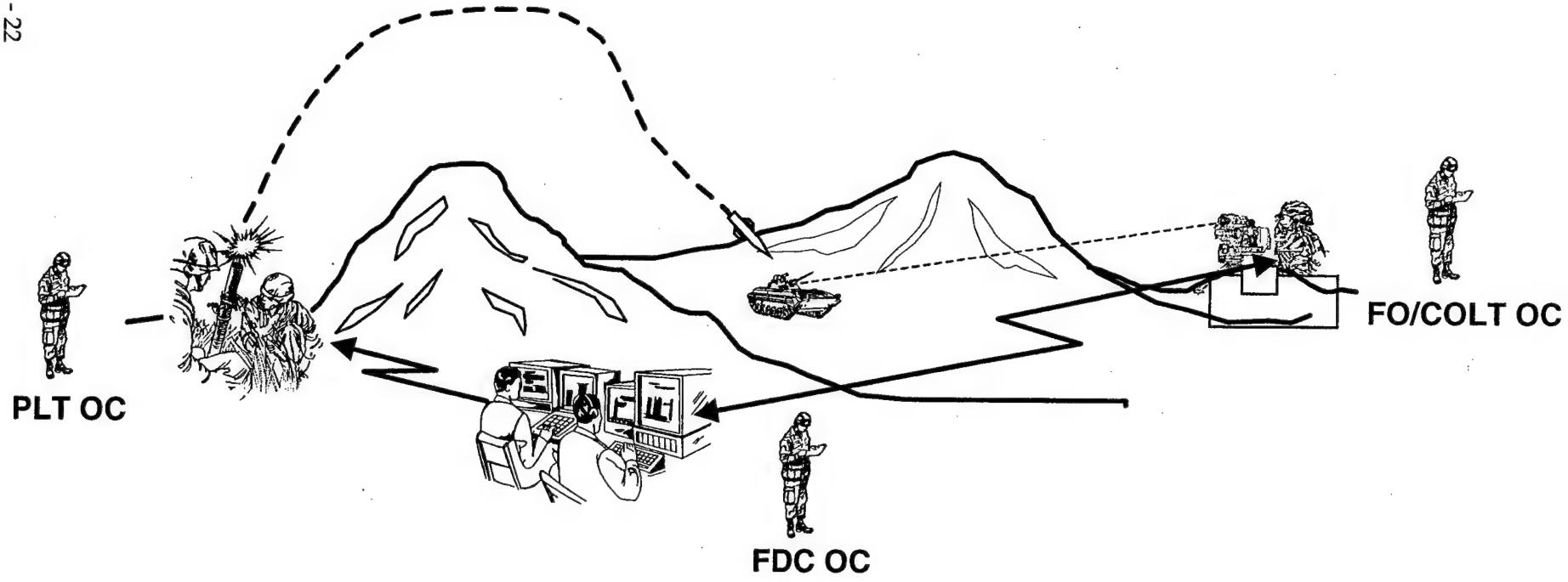
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: 120MM Precision Guided Mortar Munition (PGMM)

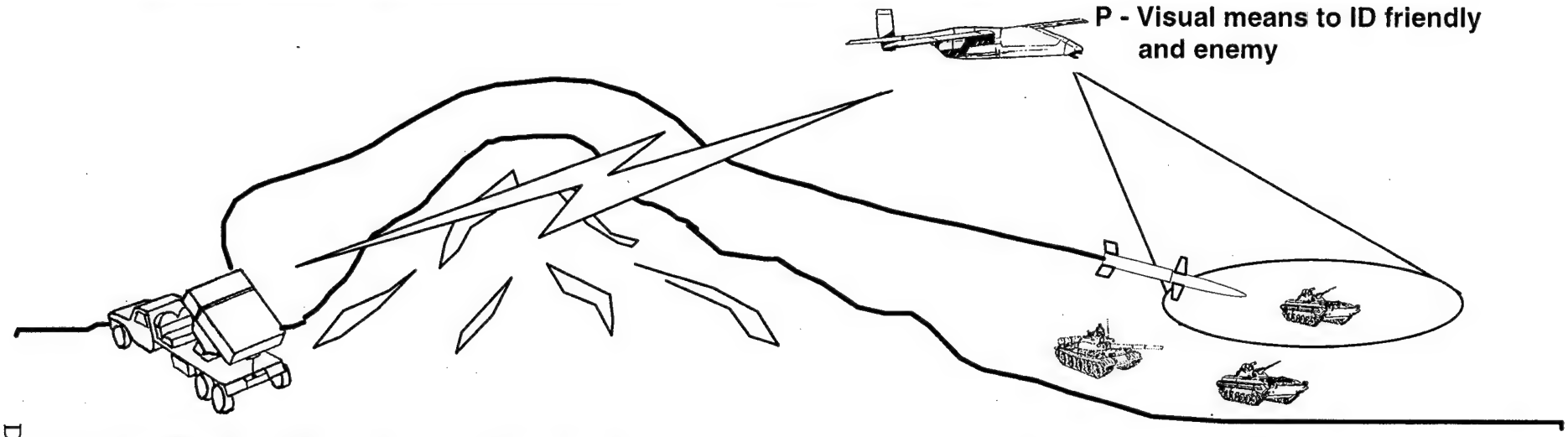
OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Locate required weapon engagement in exercise history
2. Pan the map to the engagement area
3. Scale/zoom the map to display the engagement
4. Identify and display appropriate BLUFOR control measures
5. Prepare a top down view AAR aid of engagement
6. Title the AAR aid to provide context and significance
7. Prepare statistical chart showing indirect-fire results
8. Title the chart to provide context and significance
9. Store aids in the AAR bin
10. Time tag voice communications as appropriate



Intrinsic Feedback: Enhanced Fiber Optic Guided-Missile (EFOGM) (NLOS)



P - Identification of target type and location
N - Visual/audible signature when weapon fires
N - Needs to "fly" weapon to target and "see" terrain under weapon to navigate on preplanned route and hit target

O - Visual/audible indication of impacting ordnance (direct hits only)
Visual/audible indication of ordnance effects:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Firepower kill
- O - Communications kill
- O - Type combat damage

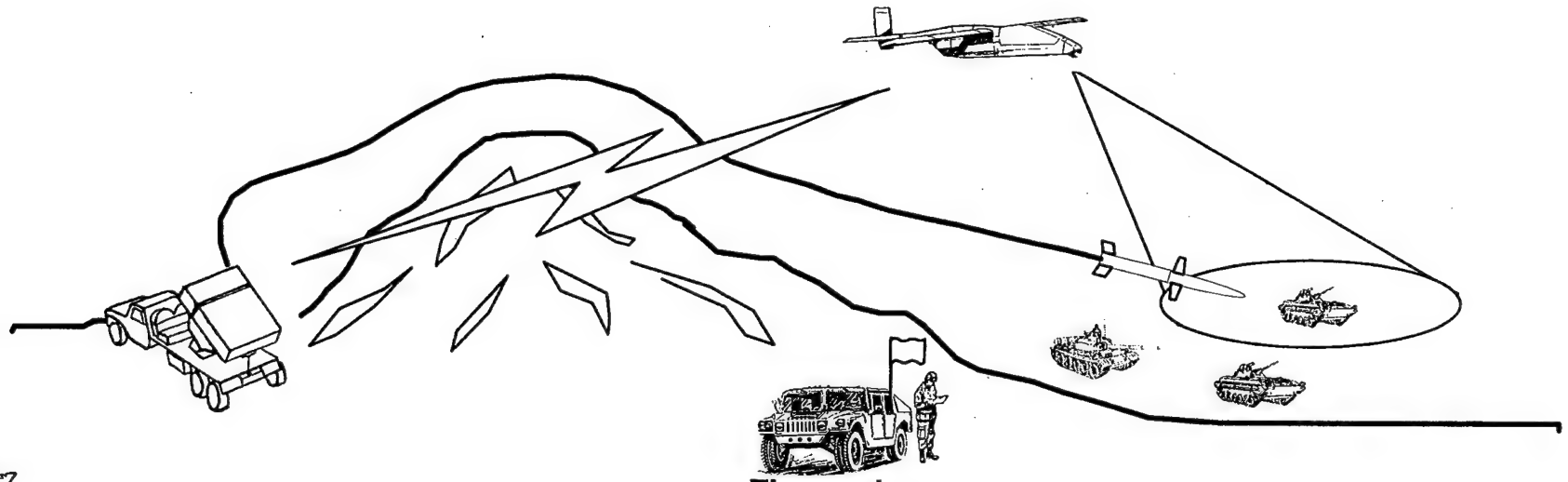
N - Visual indication of missile(s) trajectory

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Enhanced Fiber Optic Guided Missile (EFOGM) (NLOS)

S2 OC

1. Monitor observer ID, target location, and description received from UAV
2. Forward UAV target information to TAF analyst



OC

1. Provide TAF analyst the launcher ID, planned flight route, ammunition on hand, and time missile launched

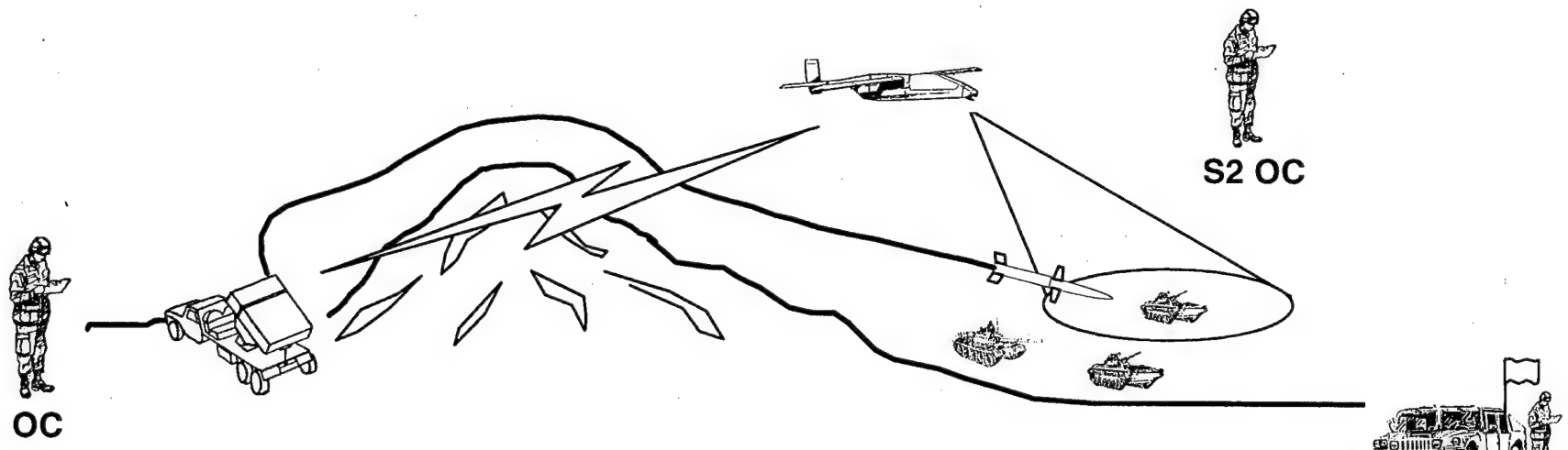
Firemarker

1. Receive location, volume and type ordnance to mark from TAF analyst
2. Navigate to location of impacting ordnance
3. Mark fires with ground burst simulators as directed by the TAF
4. Notify TAF analyst when fires marked

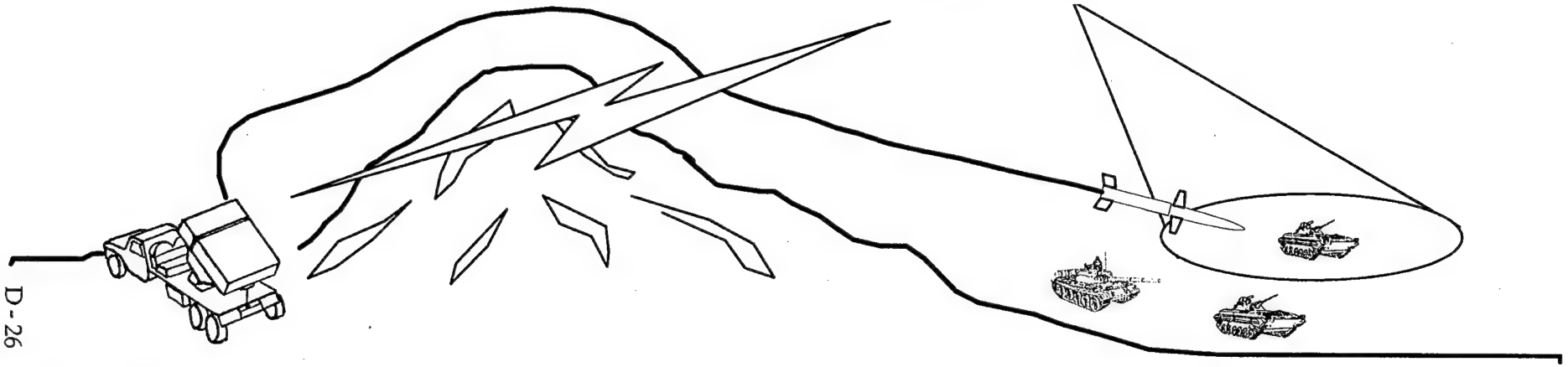
Intrinsic Feedback Functions: Enhanced Fiber Optic Guided Missile (EFOGM) (NLOS)

TAF Analyst

1. Identify Enhanced Fiber Optic Guided Missile (EFOGM) shooter on TAF workstation
2. Plot target location received from S2 OC
3. Plot planned flight route
4. Plot loiter radius of weapon to determine weapon search footprint
5. If vehicle is located at mission target location, assess battle damage based on maximum PK
6. If no vehicle is located at mission target location but within weapon search footprint, assess battle damage at lower PK
7. If calculation of PK results in kill, administratively kill vehicle from TAF facility
8. If PK does not result in kill, locate nearest firemarker and send him to mark location of impacting ordnance misses



Extrinsic Feedback: Enhanced Fiber Optic Guided-Missile (EFOGM) (NLOS)



O - Observer ID
O - Observer location
O - Target location

O - Shooter ID
O - Shooter location
O - Planned flight route
O - Time missile launched
O - Ammunition type and amount fired
O - Ammunition type and amount on hand
O - Weapon ranging capability
O - Pairing of shooter to victim
N - Actual flight route
N - Pairing of shooter to MISSES

O - Victim ID
O - Victim location
Victim status:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Firepower kill
- O - Communications kill
- O - Type combat damage

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

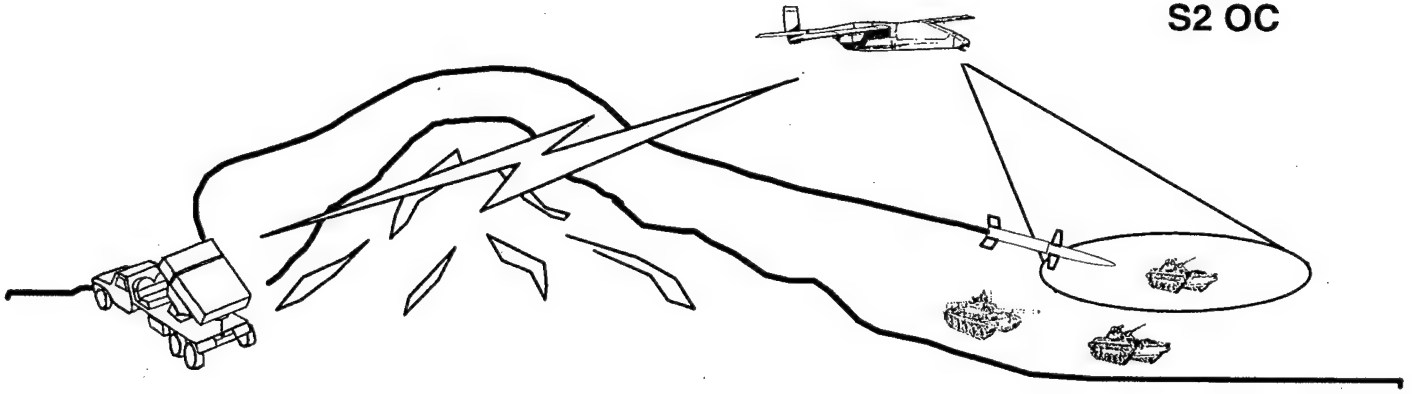
Extrinsic Feedback Functions: Enhanced Fiber Optic Guided Missile (EFOGM) (NLOS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

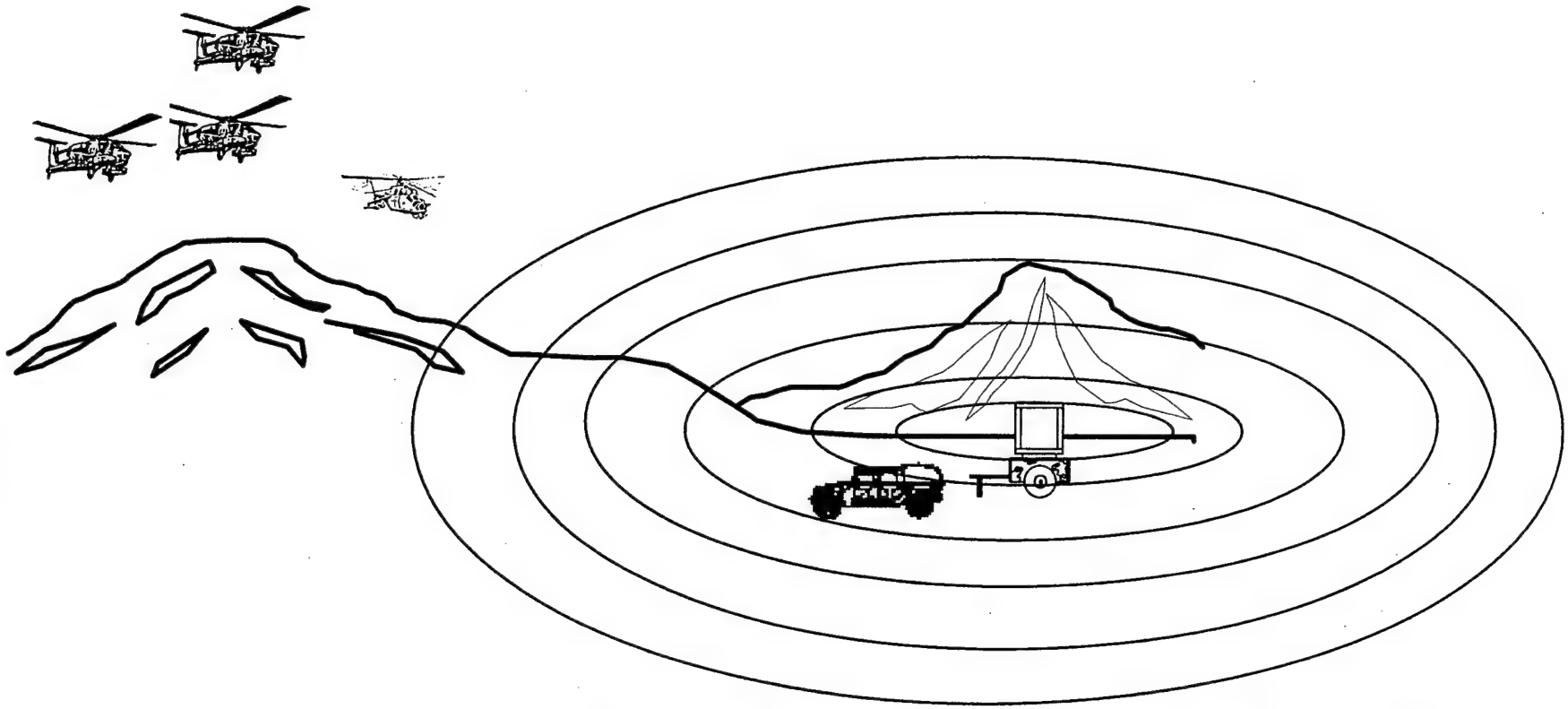
1. Locate required weapon engagement in exercise history
2. Pan the map to the engagement area
3. Scale/zoom the map to display the engagement
4. Identify and display appropriate BLUFOR control measures
5. Prepare a top down view AAR aid of the engagement
6. Title the AAR aid to provide context and significance
7. Prepare statistical chart showing indirect-fire results
8. Title the chart to provide context and significance
9. Store aids in AAR bin
10. Time tag voice communications as appropriate

S2 OC



OC

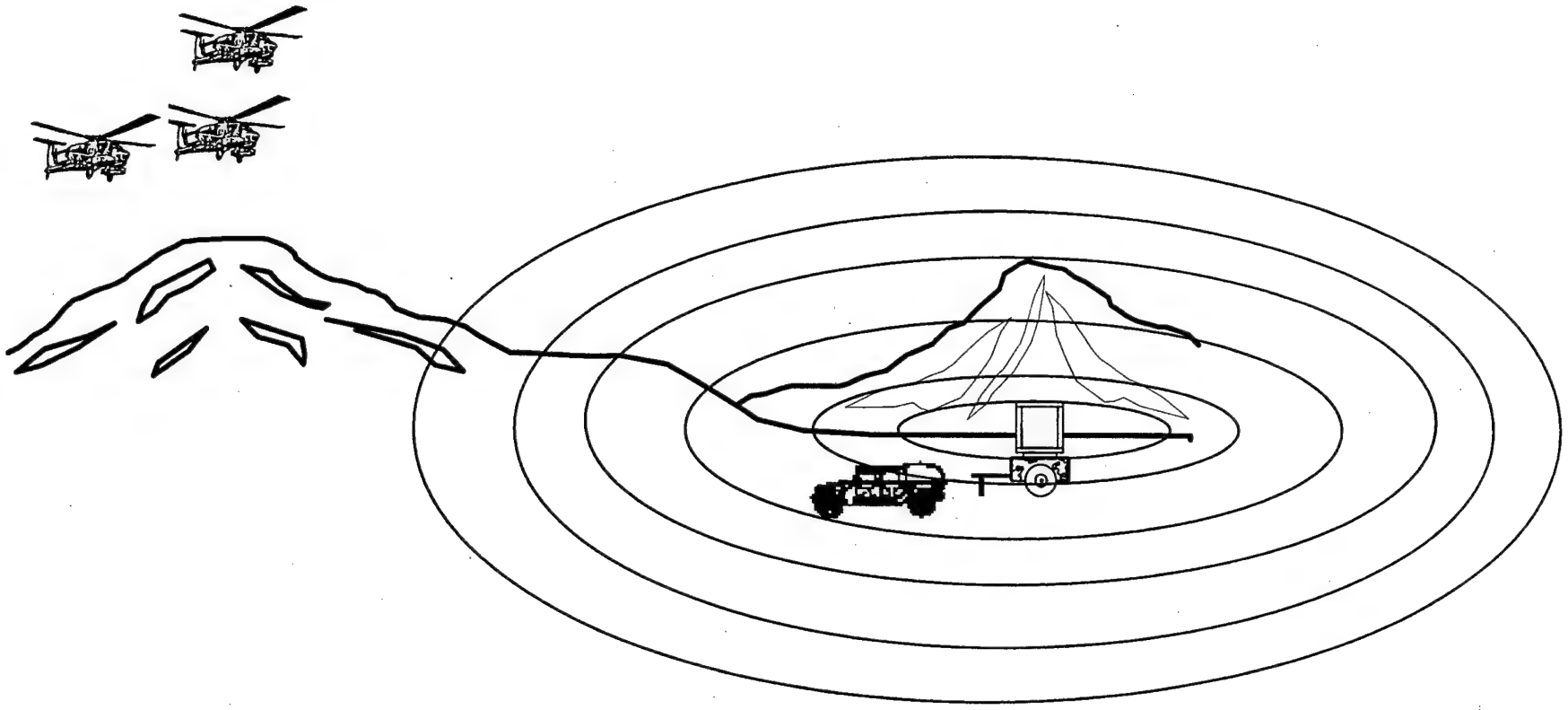
Intrinsic Feedback: FAAD Ground Based Sensor (GBS)



P - Provides means to detect, track, classify, identify, and report friendly and enemy aircraft
P - Automatically alerts and cues FAAD systems
P - Monitors and provides air situation data to command and control centers
P - Players receive feedback from their actions

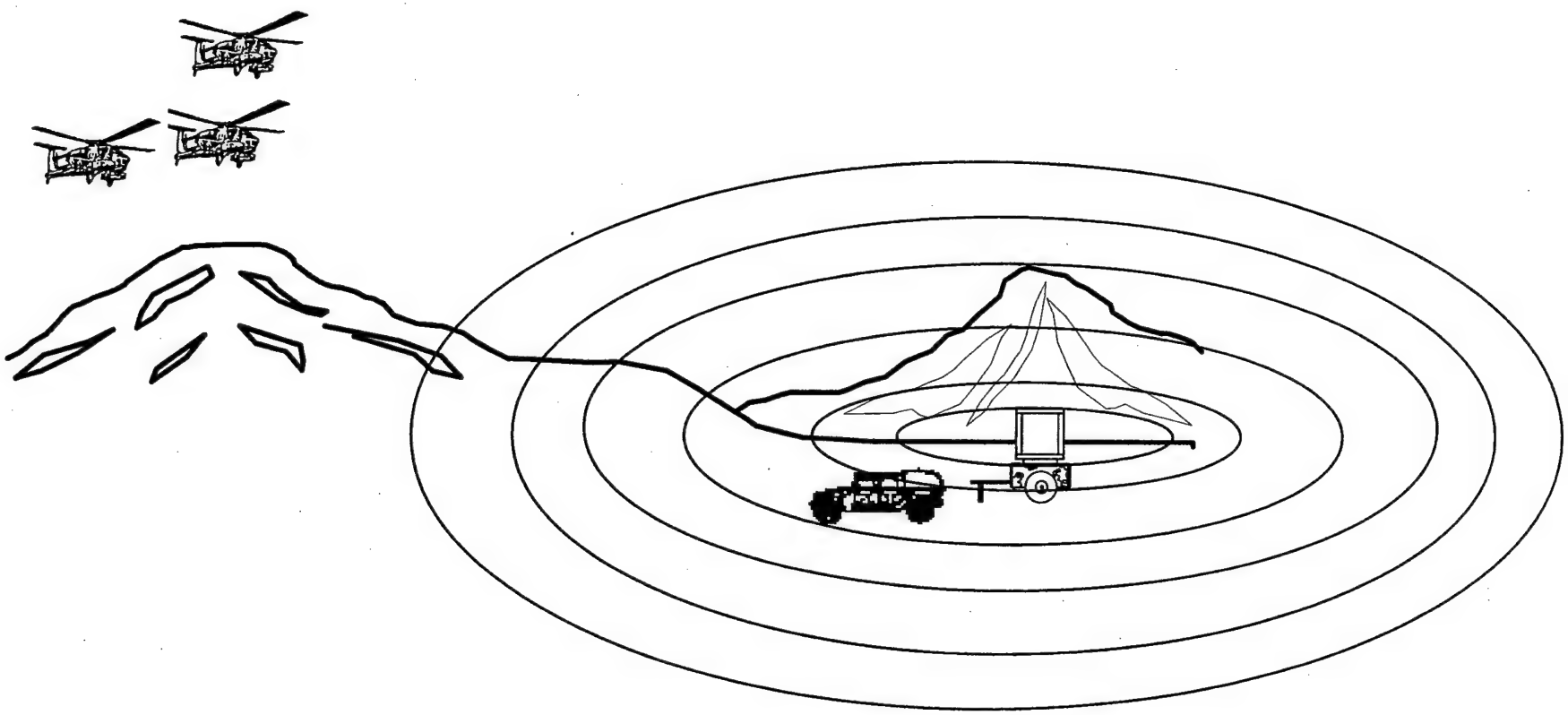
N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: FAAD Ground Based Sensor (GBS)



NO OC or TAF analyst control functions needed. Player interactions with other players and tactical equipment meet all intrinsic feedback requirements.

Extrinsic Feedback: FAAD Ground Based Sensor (GBS)



I - System ID
I - System location
I - System ranging capability
O - Search sector area and target criteria
O - Acquired targets type and location

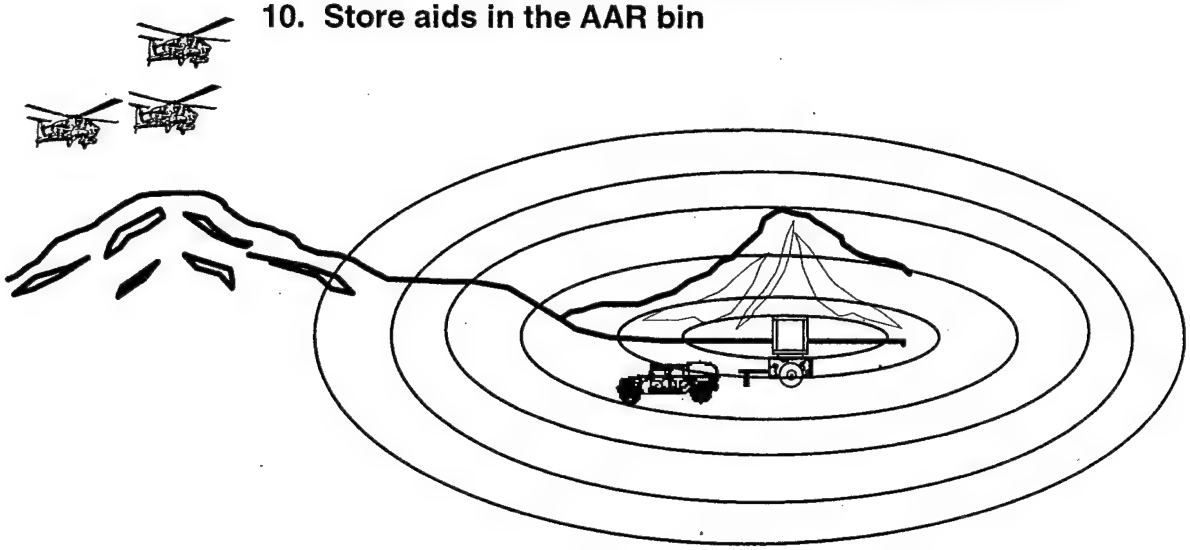
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: FAAD Ground Based Sensor (GBS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

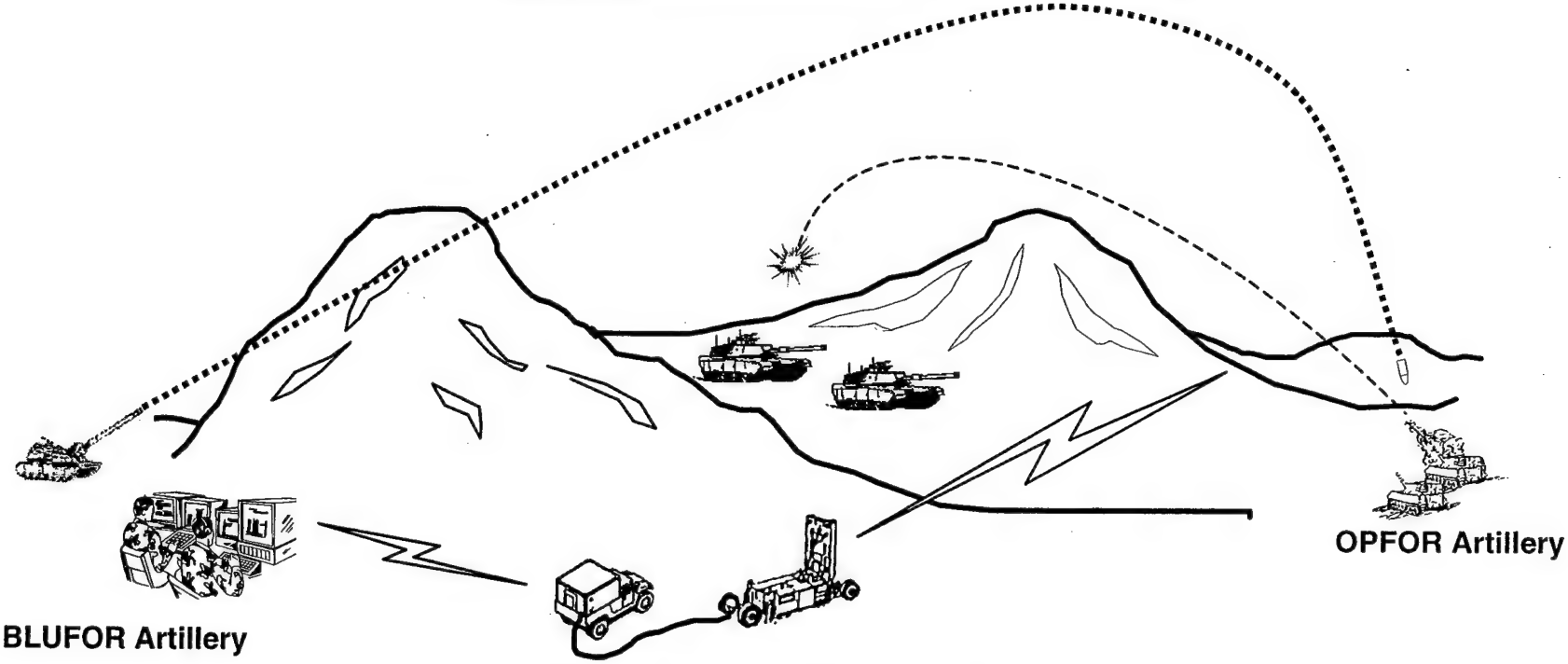
1. Record detection engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin



OC

1. Record and report search sector and target criteria for entry into TAF workstation, update changes as required
2. Record and report search criteria
3. Record and report type target and location for any targets acquired

Intrinsic Feedback: FIREFINDER



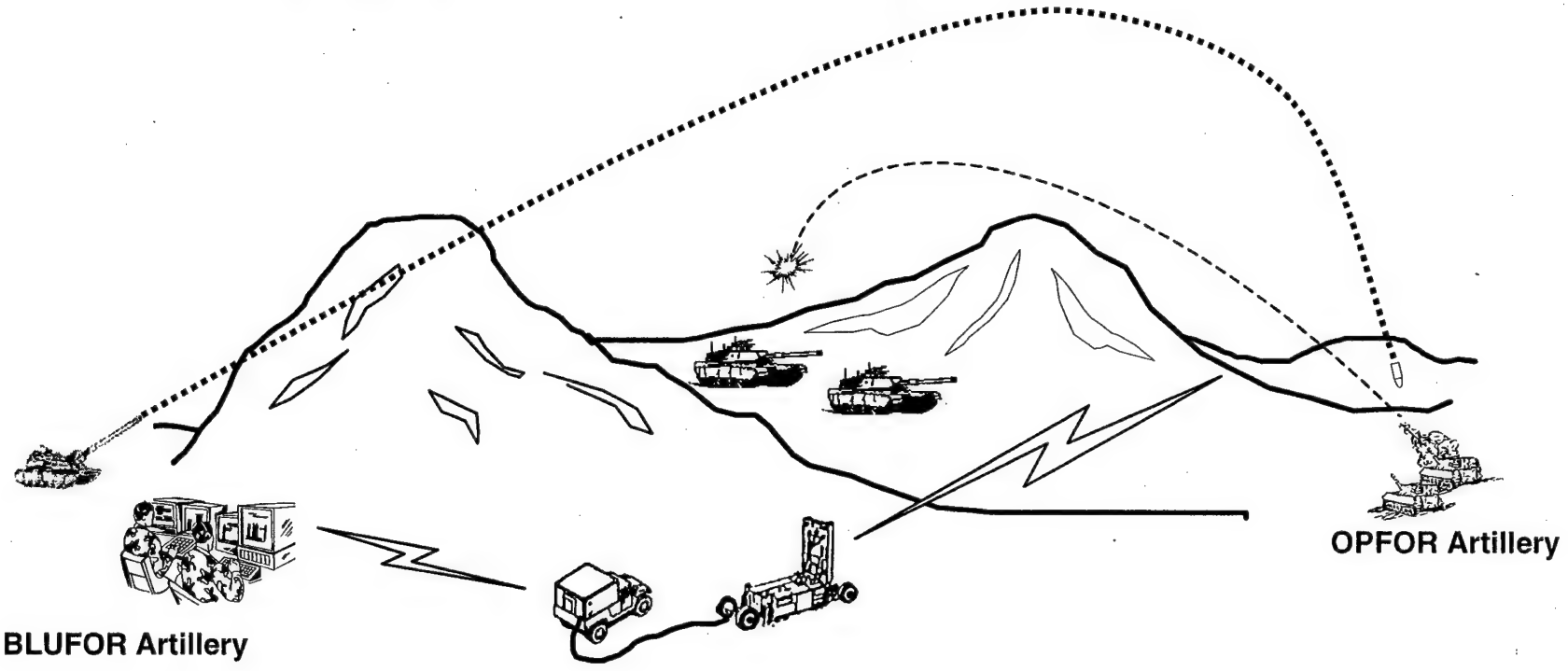
P - Radar Mission Processing Procedures
P - Supporting FDC to process Counter-Fire Mission
O - Visual means to ID friendly and enemy

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

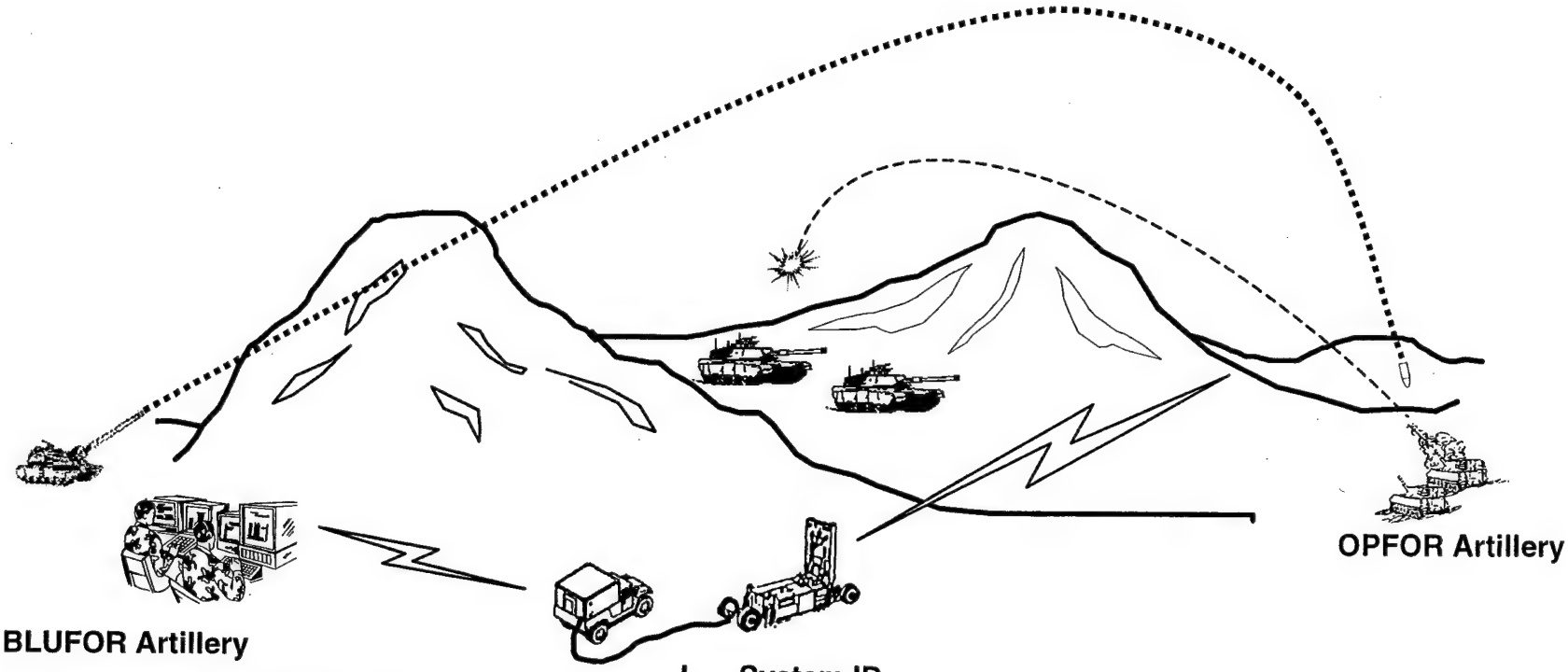
Intrinsic Feedback Functions: FIREFINDER

TAF Analyst

1. Coordinate with OPFOR LNO to receive OPFOR artillery and mortar fire missions
2. Enter OPFOR fire mission data into Radar Simulation System (RSS) workstation to determine radar activity status
3. If RSS determines radar would have detected fire mission, transmit RSS trajectory, point of origin, and impact data to appropriate radar



Extrinsic Feedback: FIREFINDER



BLUFOR Artillery

O - Counter-Fire missions received

- **I - System ID**
- **I - System location**
- **I - System orientation and search sector**
- **I - Time system actually cued**
- **O - Time RSS data sent to radar**
- **O - Time Radar detected mission received**
- **O - Time Radar section sent Counter-Fire mission to supporting FDC**

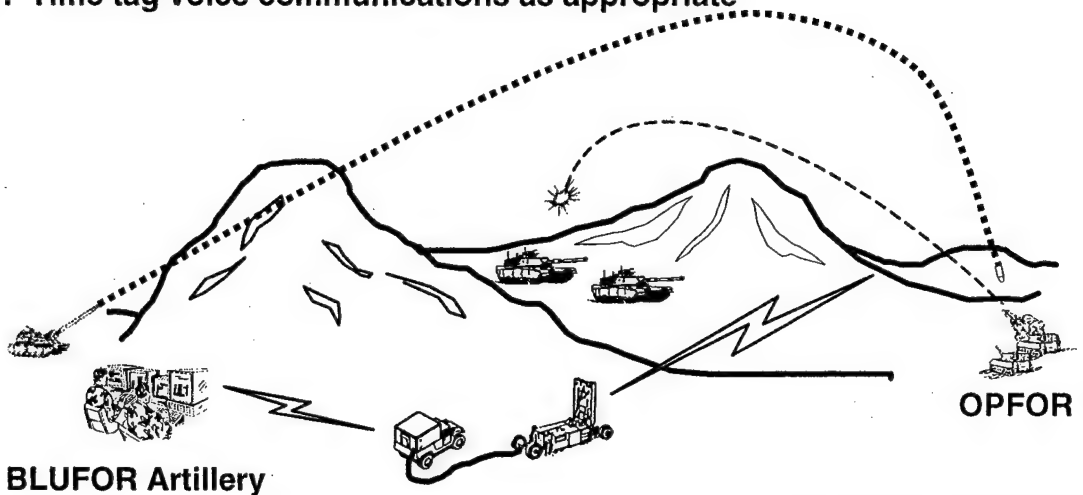
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: FIREFINDER

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record detection engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate



BLUFOR Artillery

OPFOR Artillery

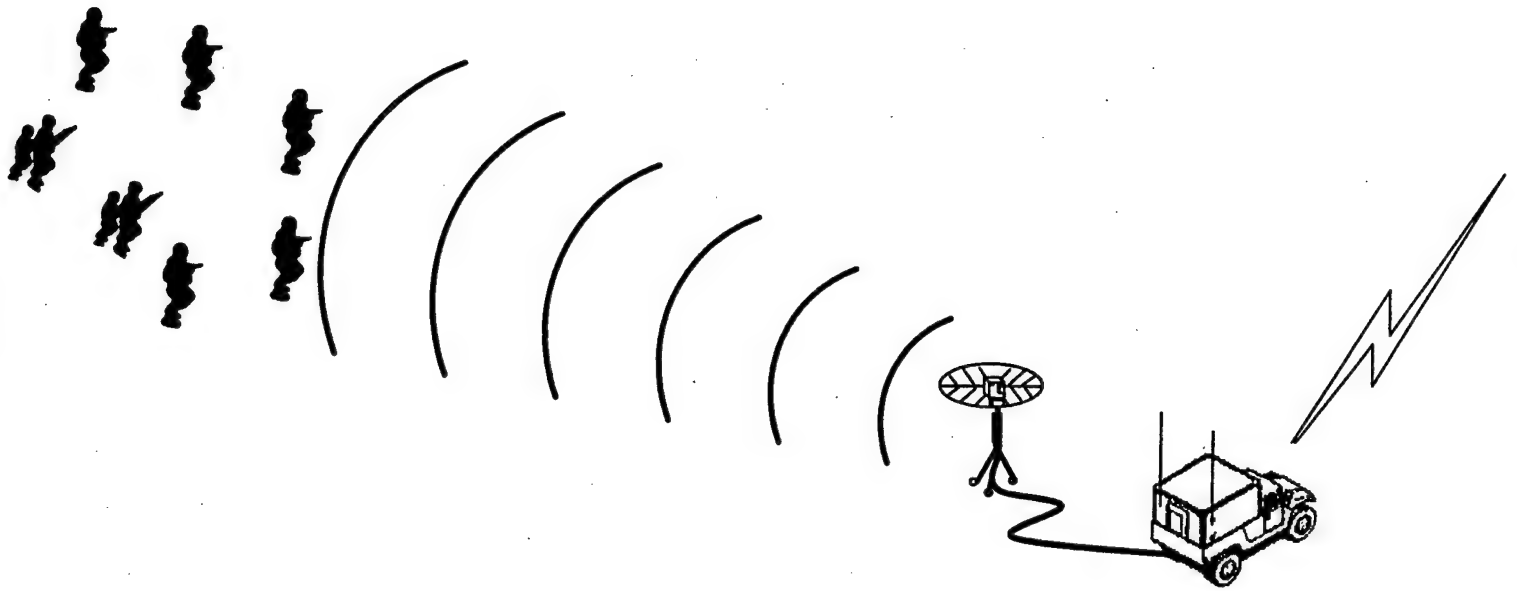
FDC OC

1. Record Radar Fire missions received

RADAR OC

1. Record time RSS mission received by radar section
2. Record assessment of radar section procedures
3. Record time mission sent to supporting FDC

Intrinsic Feedback: Ground Surveillance Radar (GSR)



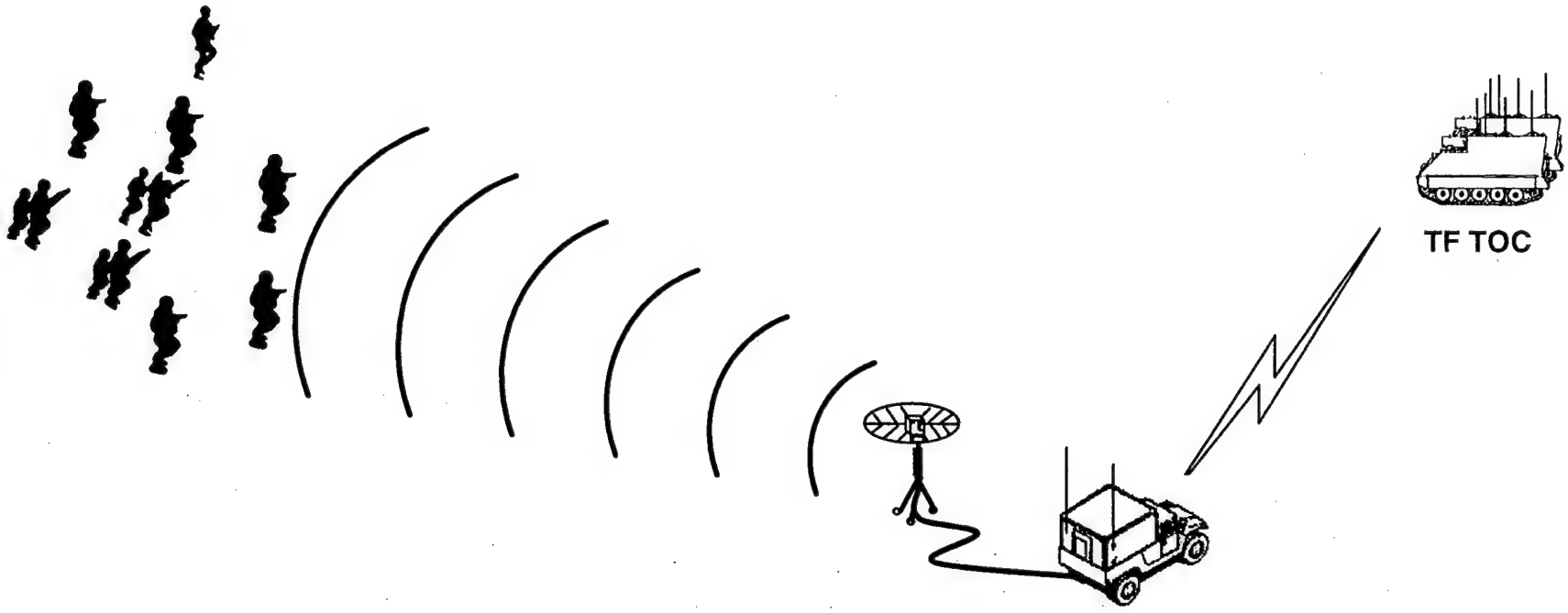
TF TOC

P - Process targets received

P - Detection of moving target indicators
P - Determine target type, location, direction, and speed

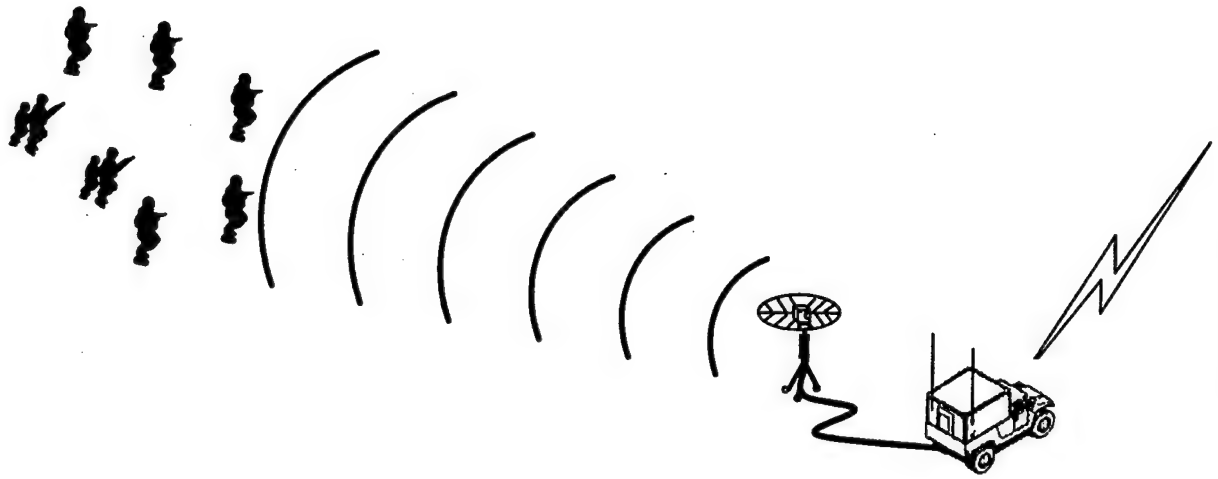
N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Ground Surveillance Radar (GSR)



NO OC or TAF analyst control functions needed. Player interactions with other players and tactical equipment meet all intrinsic feedback requirements.

Extrinsic Feedback: Ground Surveillance Radar (GSR)



TF TOC

O - Target location
O - Target type
O - Target direction
O - Target speed
N - Player response to target acquisition

I - System ID
I - System location
O - System search sector
O - Target location, direction, speed
O - Target type

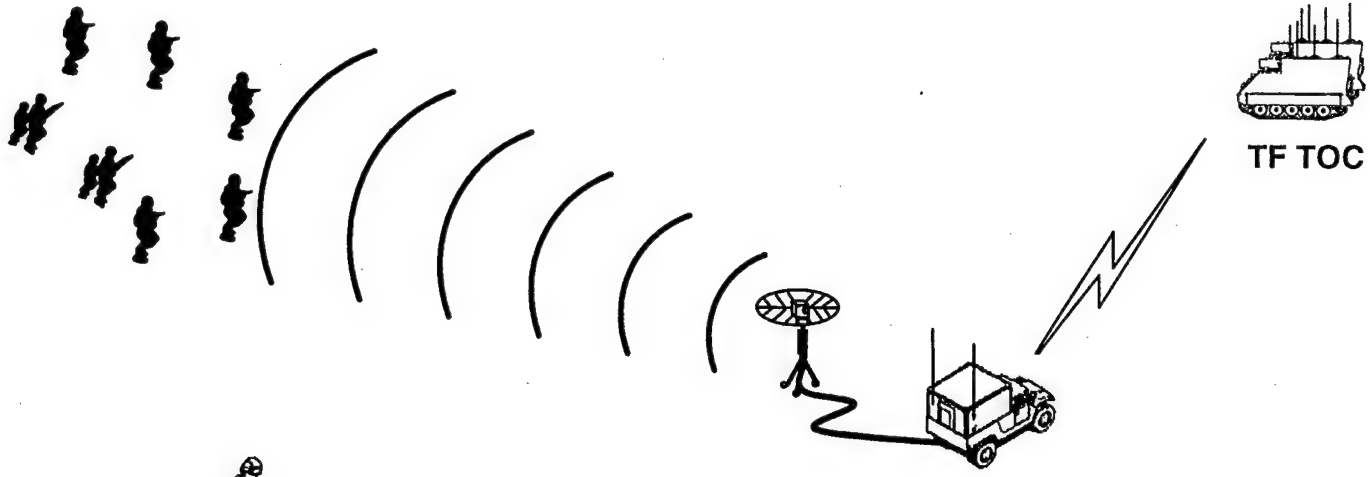
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Ground Surveillance Radar (GSR)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record detection engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin



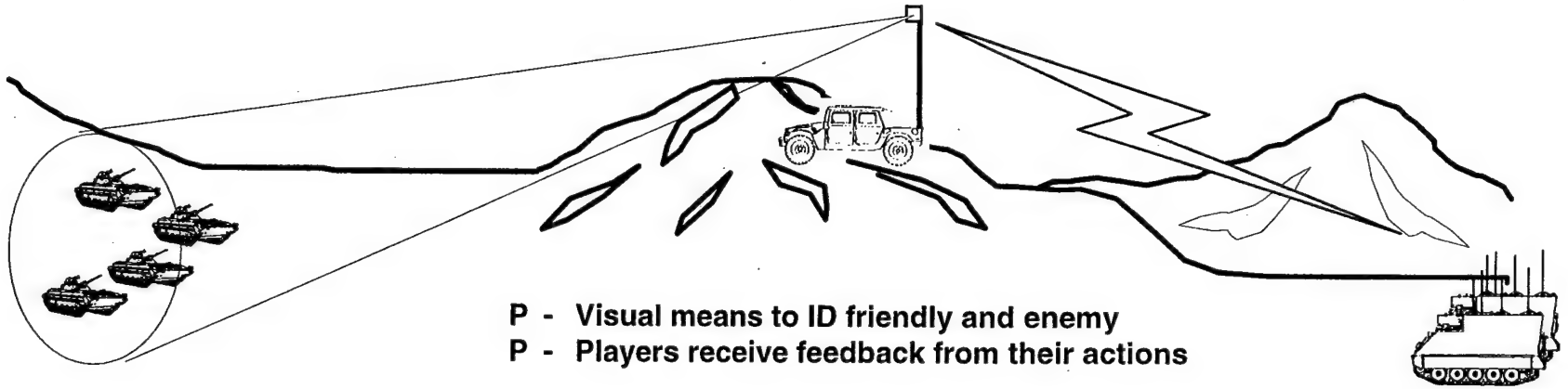
TF TOC

OC

1. Record and report GSR search sector to TAF analyst for entry into TAF workstation
2. Record and report target type, location, direction, speed, and time detected for all targets found

Intrinsic Feedback: Hunter Sensor Suite

2nd Generation FLIR
Moving Target Indicator Radar
2 daylight cameras
Laser Range Finder
Automatic Target Recognition



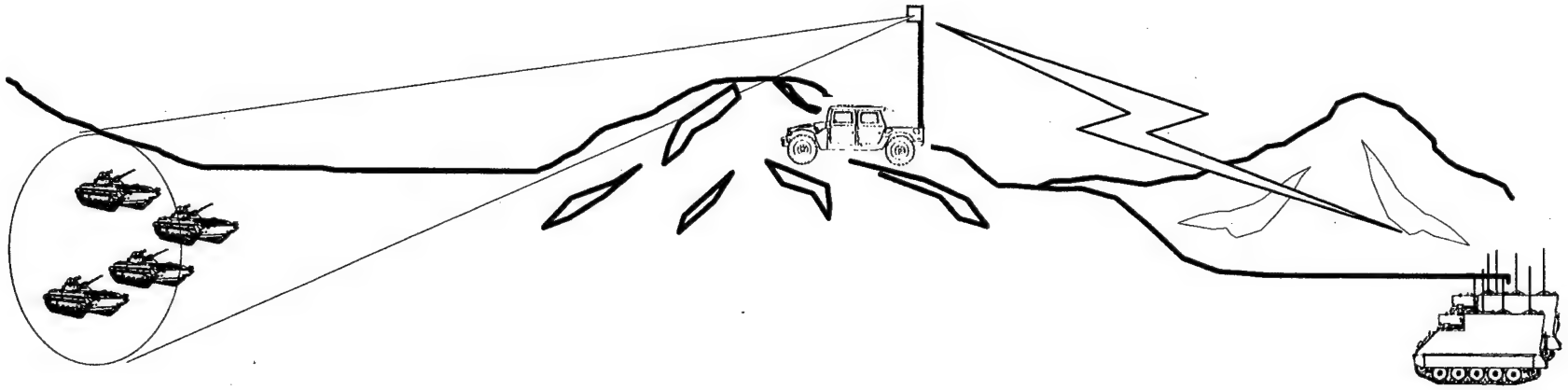
P - Visual means to ID friendly and enemy
P - Players receive feedback from their actions

TF TOC

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Hunter Sensor Suite

2nd Generation FLIR
Moving Target Indicator Radar
2 daylight cameras
Laser Range Finder
Automatic Target Recognition

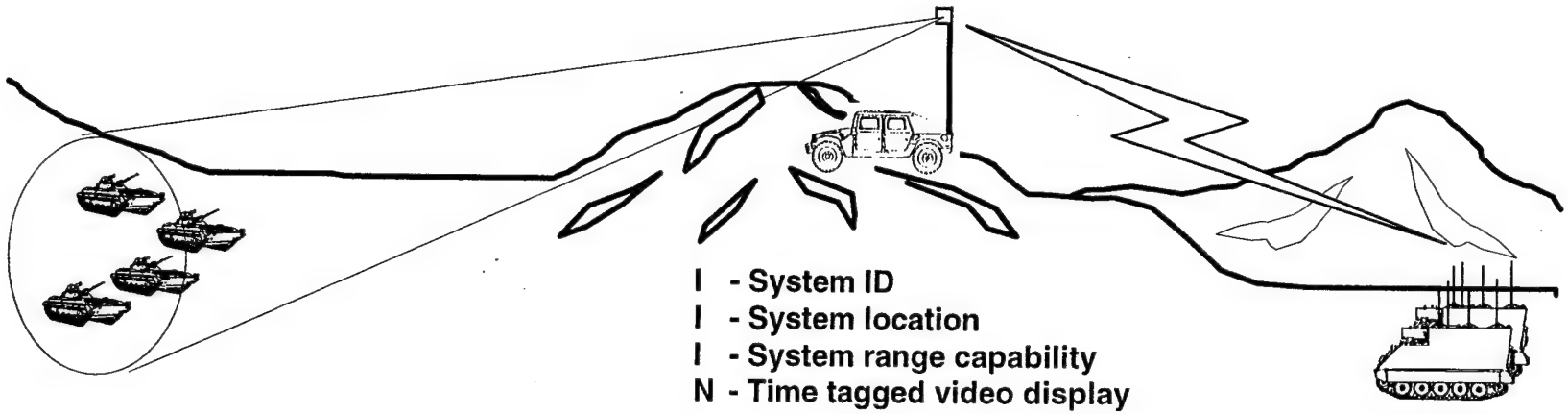


TF TOC

NO OC or TAF analyst control functions needed. Player interactions with other players and tactical equipment meet all intrinsic feedback requirements.

Extrinsic Feedback: Hunter Sensor Suite

2nd Generation FLIR
Moving Target Indicator Radar
2 daylight cameras
Laser Range Finder
Automatic Target Recognition



I - System ID
I - System location
I - System range capability
N - Time tagged video display

TF TOC

O - Search sector area and target criteria
O - Acquired targets type and location

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

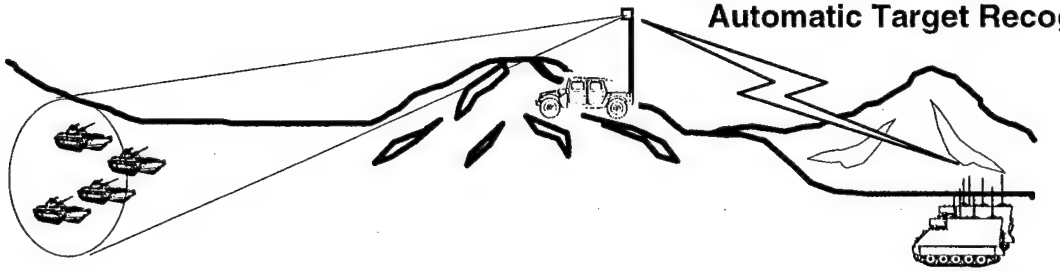
Extrinsic Feedback Functions: Hunter Sensor Suite

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record detection engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin

2nd Generation FLIR
Moving Target Indicator Radar
2 daylight cameras
Laser Range Finder
Automatic Target Recognition

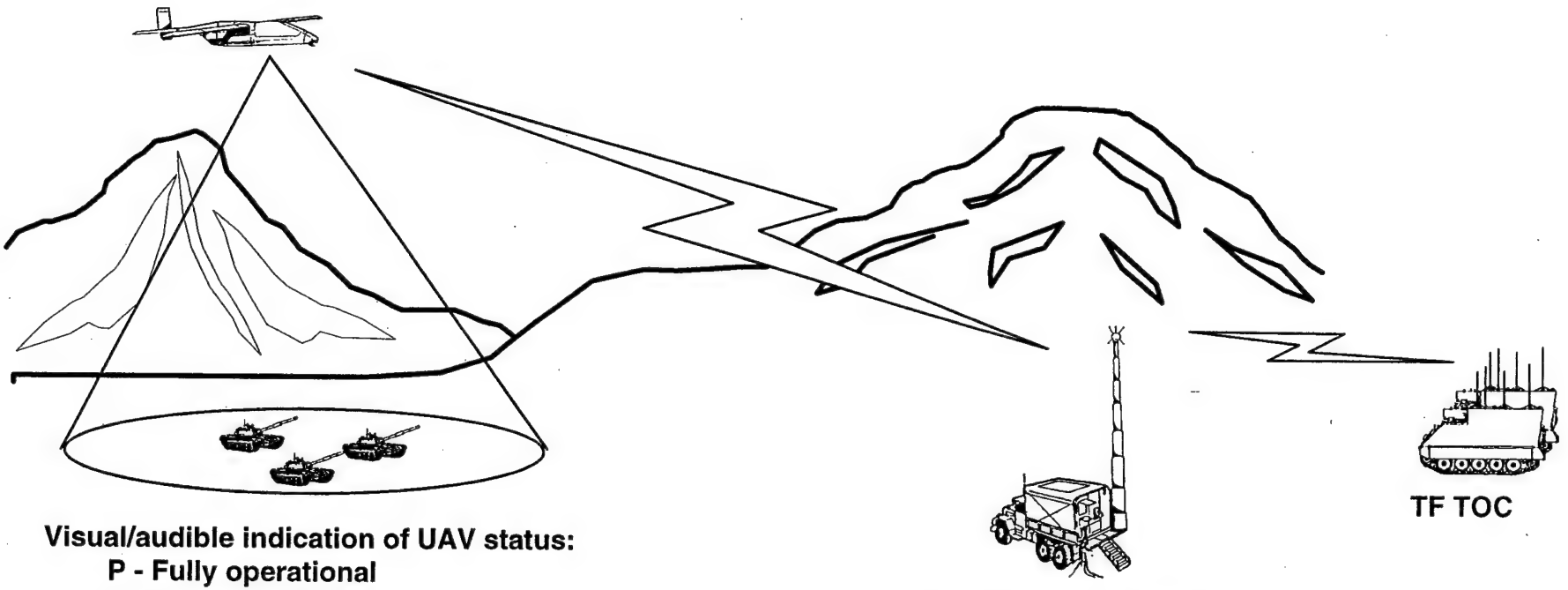


TF TOC

OC

1. Record and report search sector and target criteria for entry into TAF workstation, update changes as required
2. Record and report search criteria
3. Record and report type target and location for any targets acquired

Intrinsic Feedback: Maneuver UAV



Visual/audible indication of UAV status:

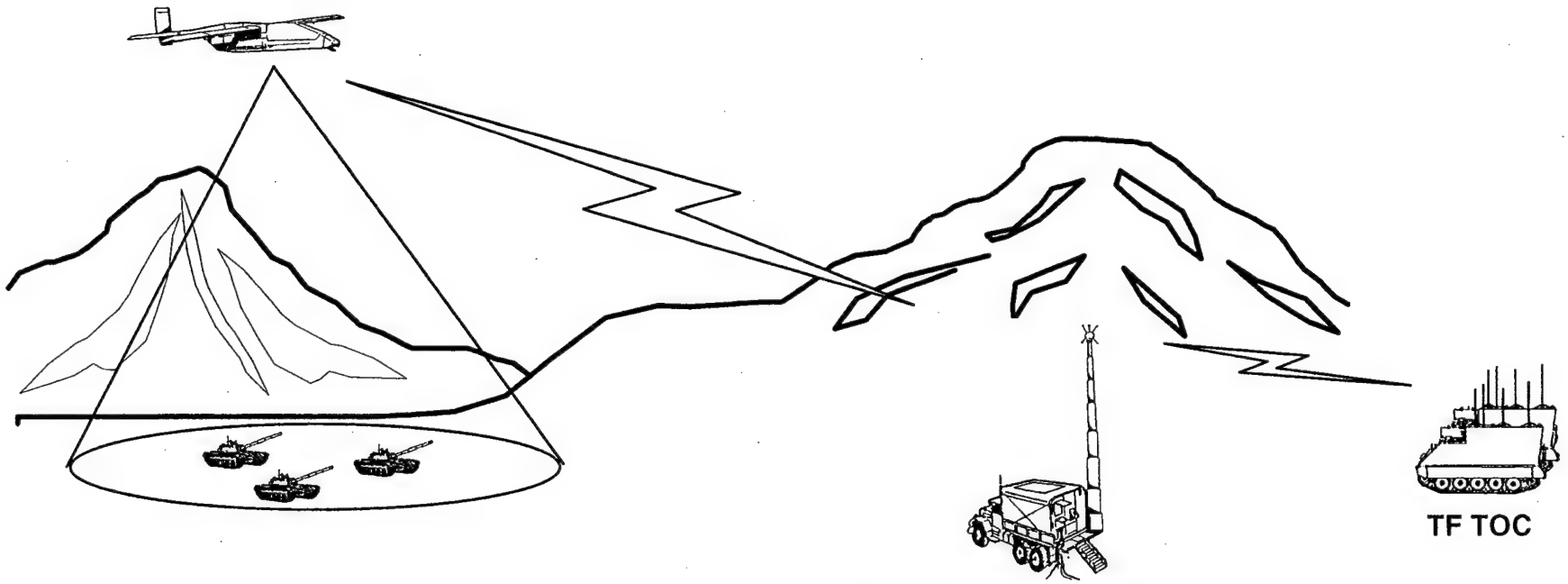
- **P - Fully operational**
- **N - Catastrophic kill**
- **N - Communications kill**

Ground Control Station

- **P - Visual means to ID friendly and enemy**
- **P - Players receive feedback from their actions**

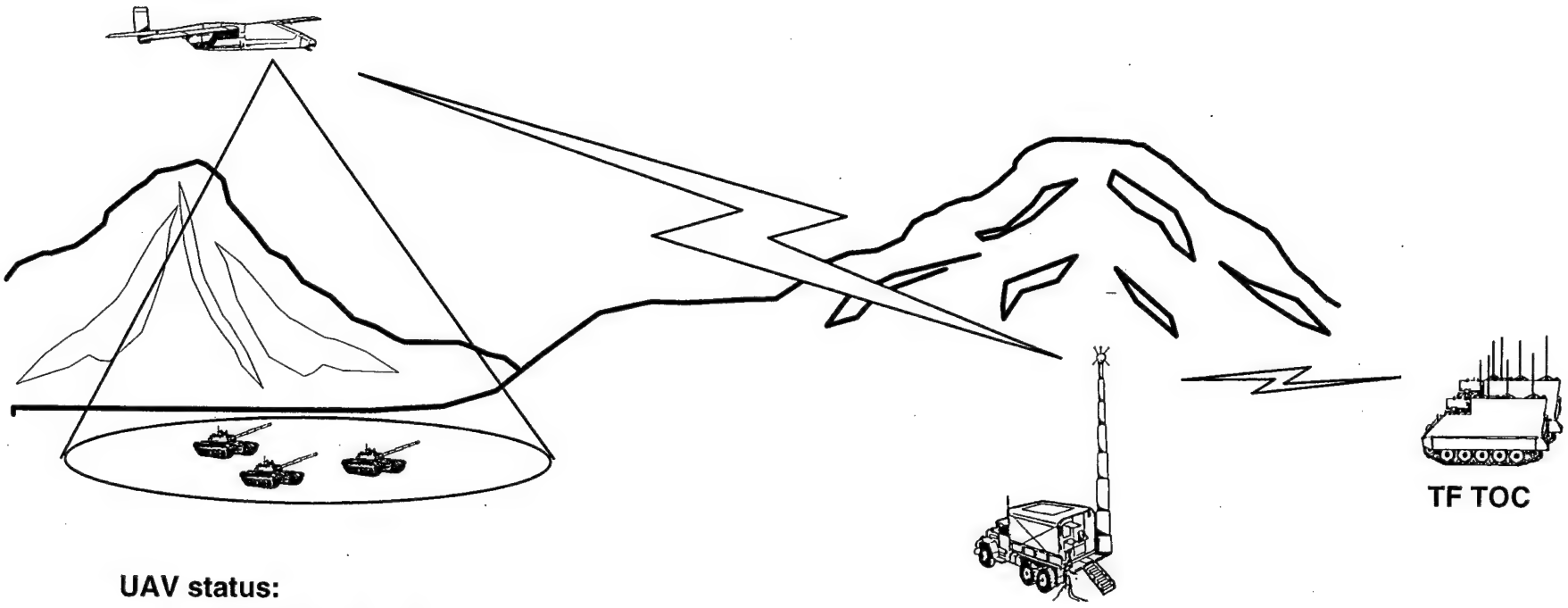
N	= No Feedback
T	= TES Feedback
O	= OC/TAF Feedback
P	= Player Hands-On Feedback

Intrinsic Feedback Functions: Maneuver UAV



NO OC or TAF analyst control functions needed. Player interactions with other players and tactical equipment meet all intrinsic feedback requirements.

Extrinsic Feedback: Maneuver UAV



UAV status:
- N - Catastrophic kill
- N - Communications kill

N - Time tagged video display

Ground Control Station

- I - System ID
- I - System location
- I - System range Capability
- O - UAV ID
- O - UAV location
- O - Planned/Revised flight plan
- O - Search sector area and target criteria
- O - Acquired targets type and location

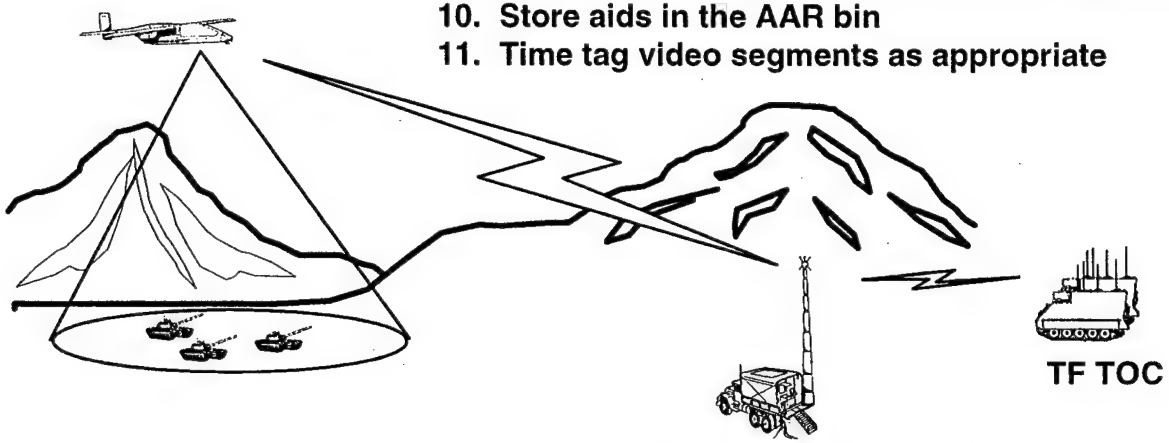
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Maneuver UAV

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record detection engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin
11. Time tag video segments as appropriate



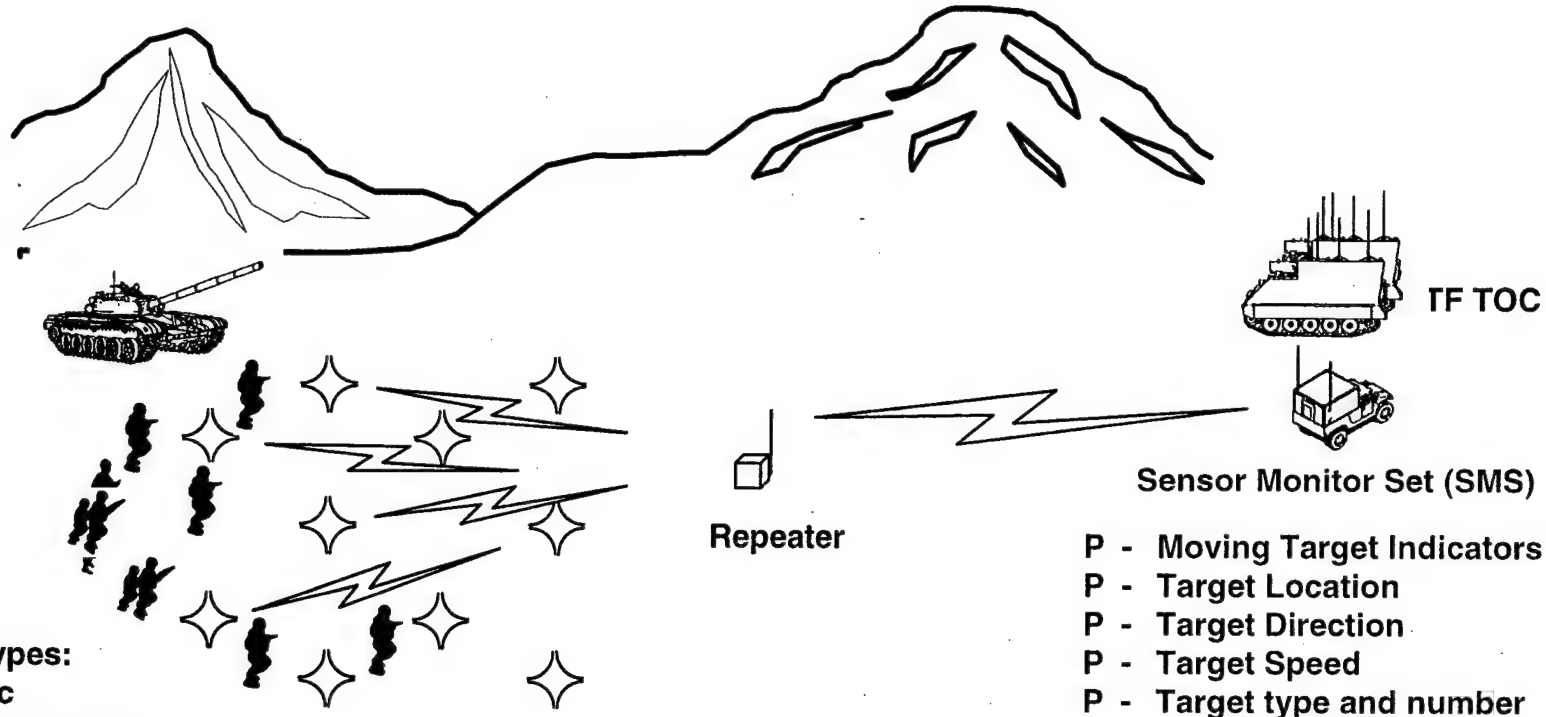
TF TOC

Ground Control Station

OC

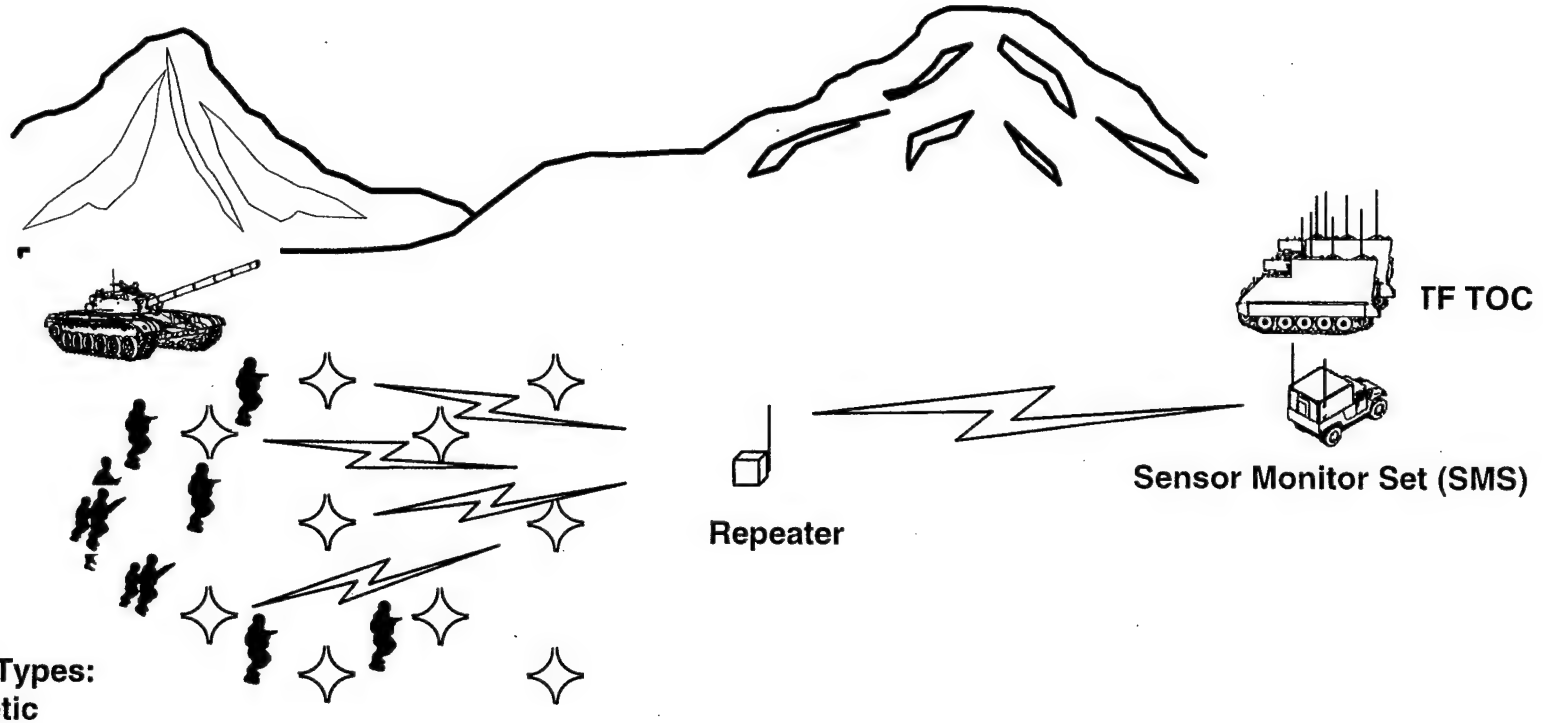
1. Record and report System ID, Location, and range capability
2. Record and report UAV flight route, search sector, and target criteria for entry into TAF workstation
3. Report changes to flight plan as required
4. Record and report type target and location for any targets acquired

Intrinsic Feedback: Remotely Monitored Battlefield Sensor System (REMBASS)



N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

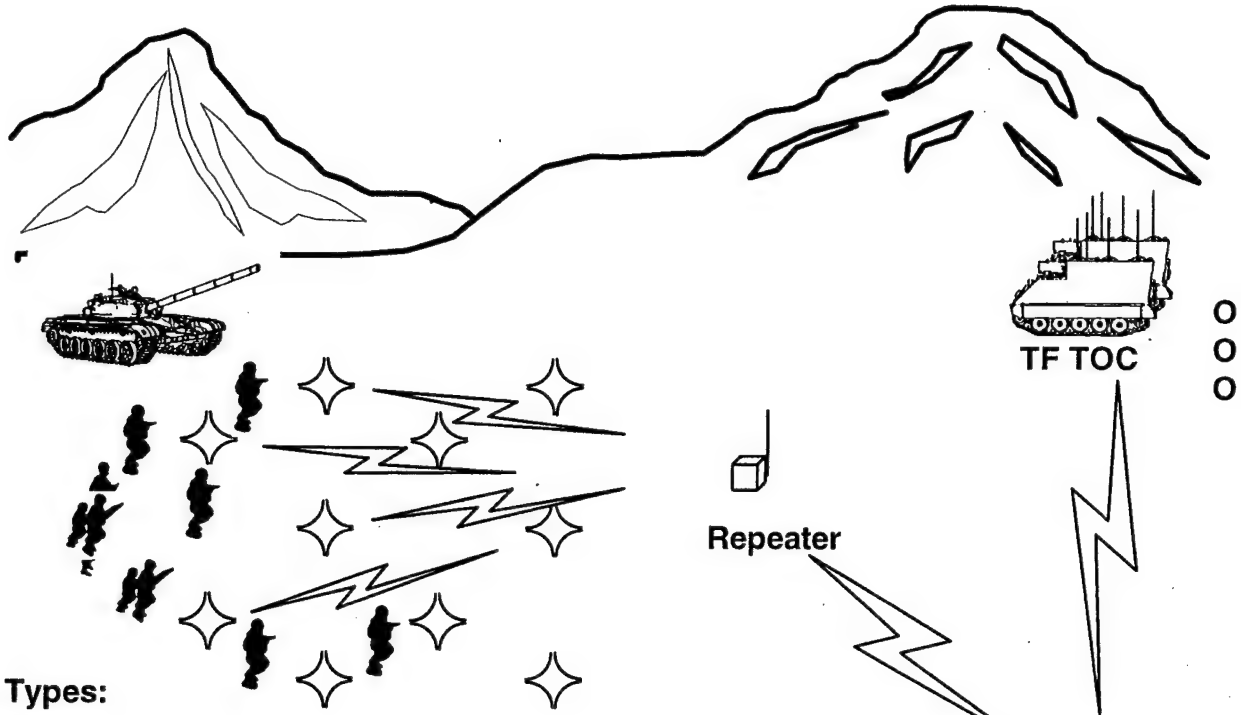
Intrinsic Feedback Functions: Remotely Monitored Battlefield Sensor System (REMBASS)



Sensor Types:
- Magnetic
- Seismic-Acoustic
- Passive Infrared

NO OC or TAF analyst control tasks needed. Player interactions with other players and tactical equipment meet all intrinsic feedback requirements.

Extrinsic Feedback: Remotely Monitored Battlefield Sensor System (REMBASS)



TF TOC

O - Target type and location
O - Target direction and speed
O - Number of targets detected

Repeater

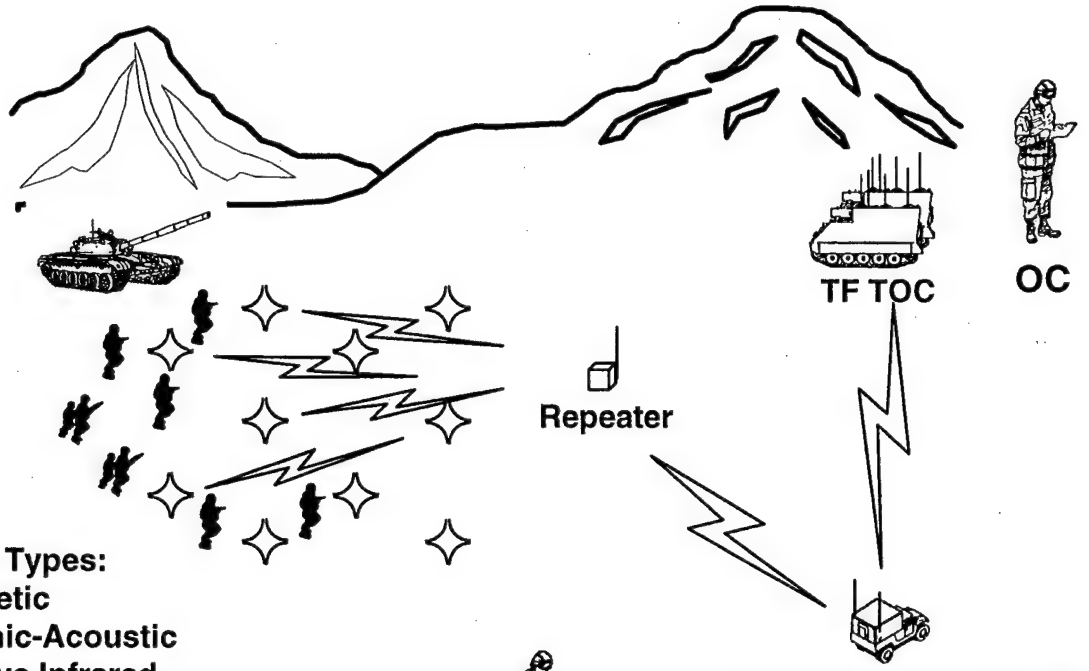
Sensor Types:
- Magnetic
- Seismic-Acoustic
- Passive Infrared

Sensor Monitor Set (SMS)

- O - Sensor monitor set ID
- O - Sensor monitor set location
- O - Sensor area of coverage
- O - Sensor types used
- O - Sensor locations

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Remotely Monitored Battlefield Sensor System (REMBASS)



1. Record and report type target, location, strength, and activity for any targets acquired

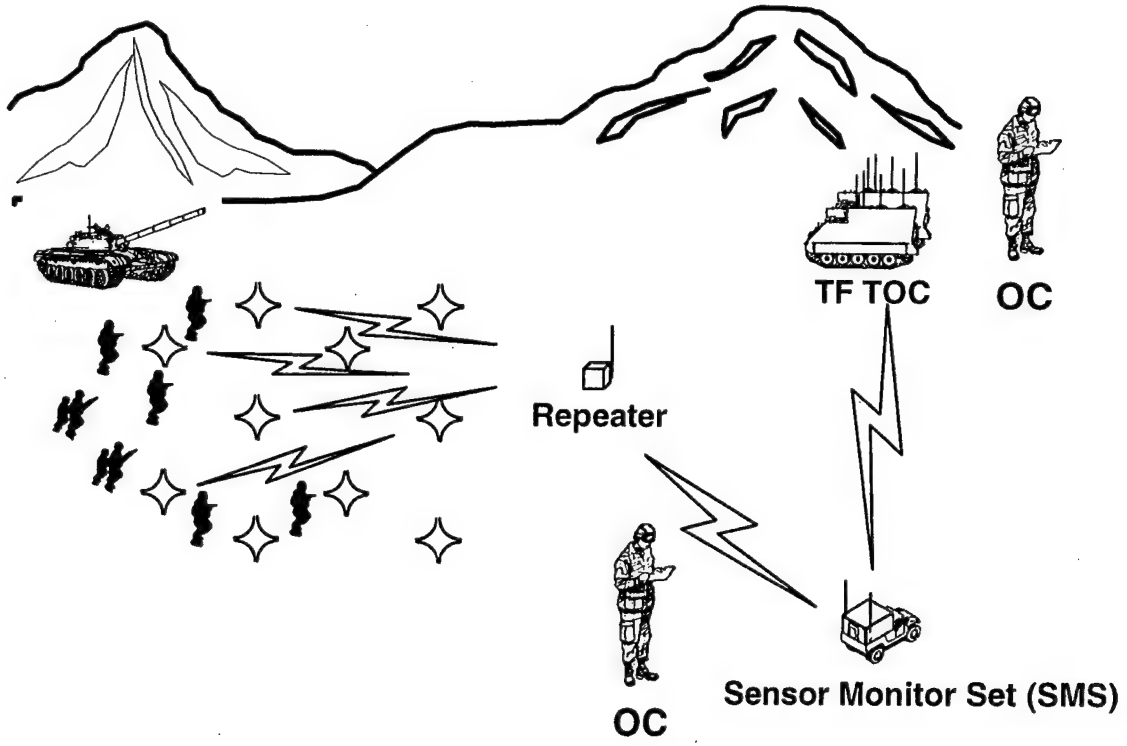
1. Record and report Sensor Monitor Set ID and location
2. Record and report sensor coverage area, locations, and sensor type for entry into TAF workstation

Extrinsic Feedback Functions: Remotely Monitored Battlefield Sensor System (REMBASS)

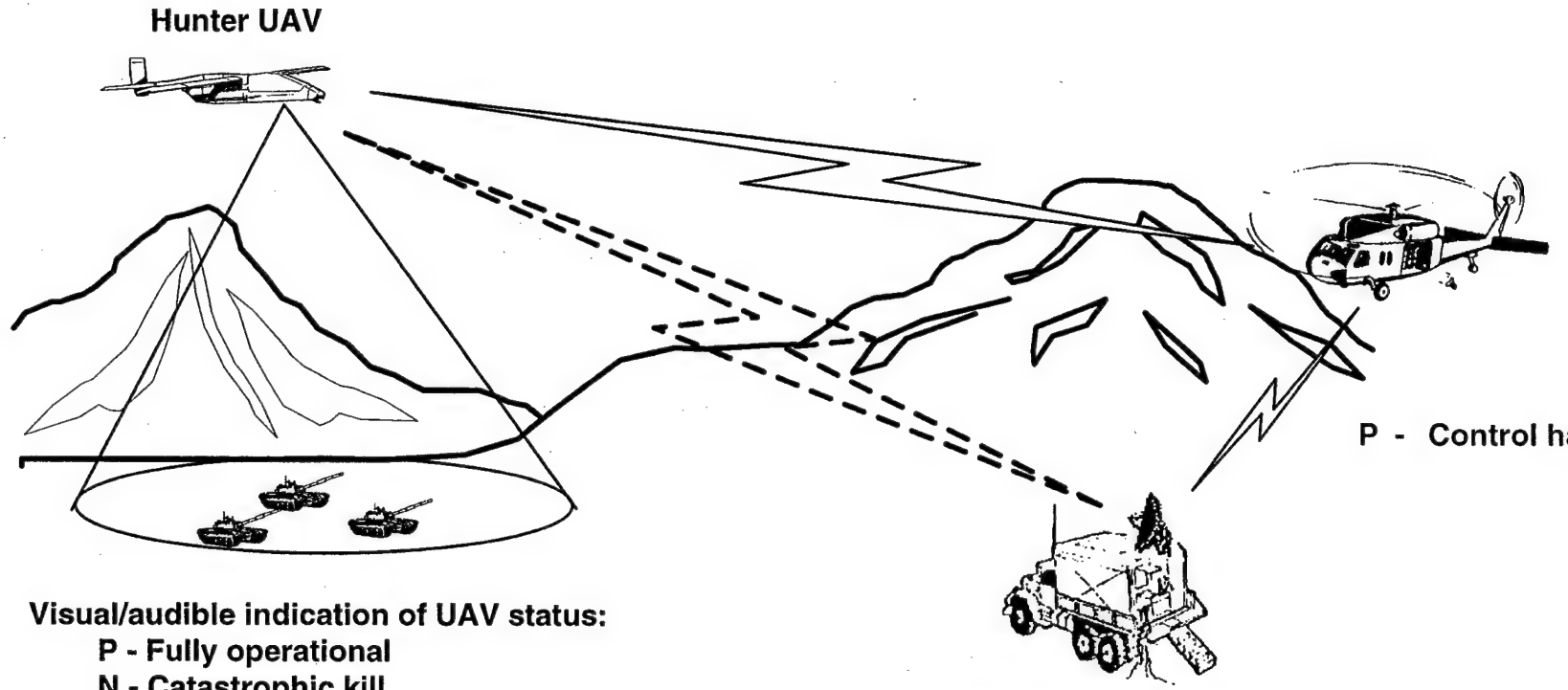
OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record detection engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin



Intrinsic Feedback: Bird Dog UAV



P - Control hand-off

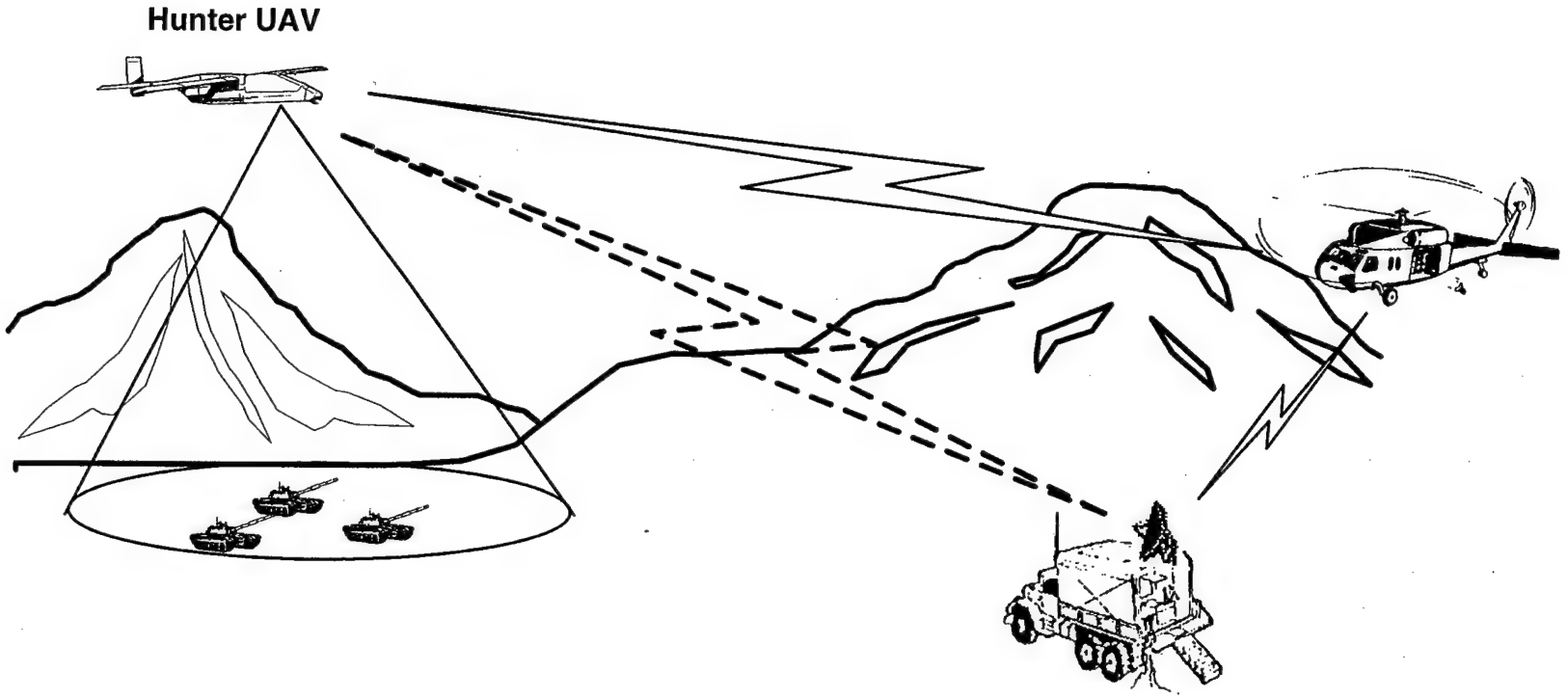
Visual/audible indication of UAV status:
- P - Fully operational
- N - Catastrophic kill
- N - Communications kill

Ground Control Station

P - Visual means to ID friendly and enemy
P - Players receive feedback from their actions

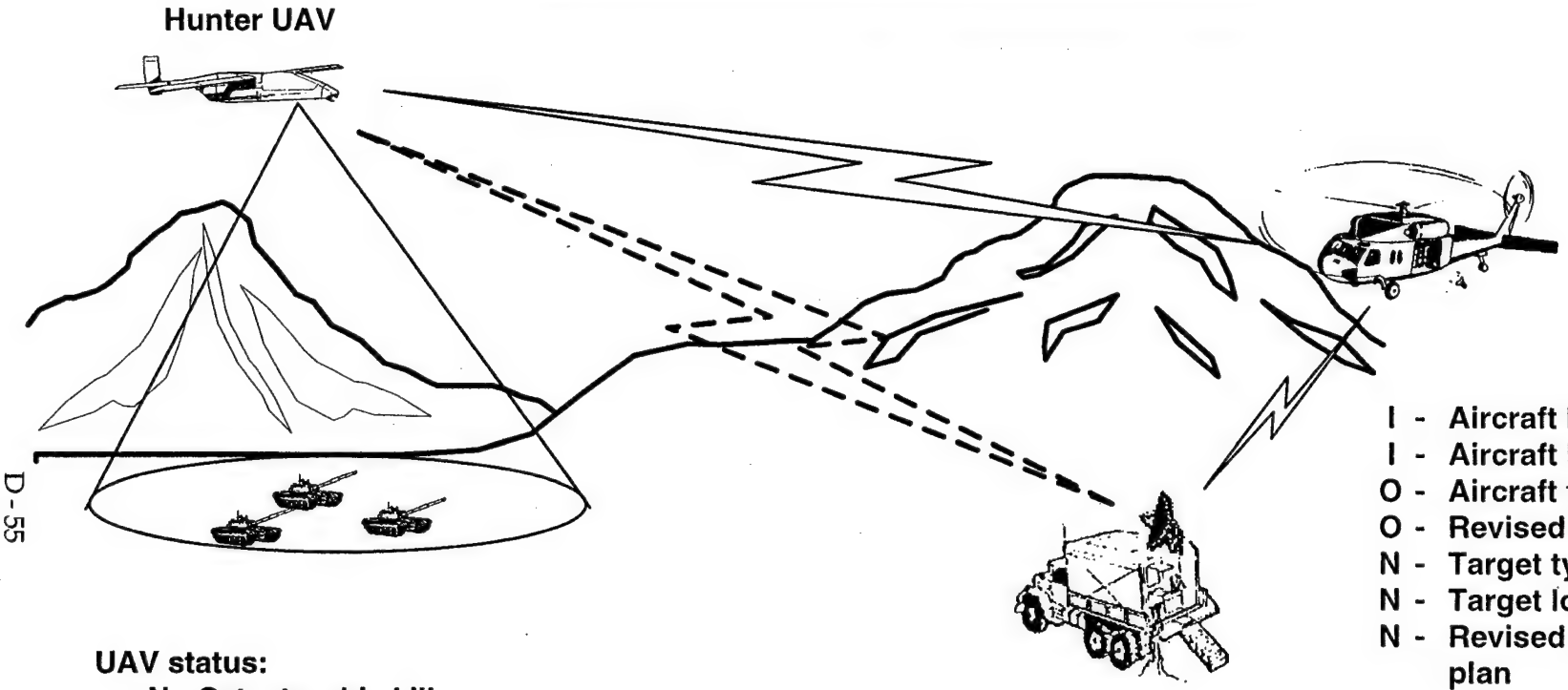
N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Bird Dog UAV



NO OC or TAF analyst control tasks needed. Player interactions with other players and tactical equipment meet all intrinsic feedback requirements.

Extrinsic Feedback: Bird Dog UAV



I - Aircraft ID
I - Aircraft location
O - Aircraft flight plan
O - Revised flight plan
N - Target type
N - Target location
N - Revised UAV flight plan

UAV status:
- N - Catastrophic kill
- N - Communications kill

N - Time tagged video display

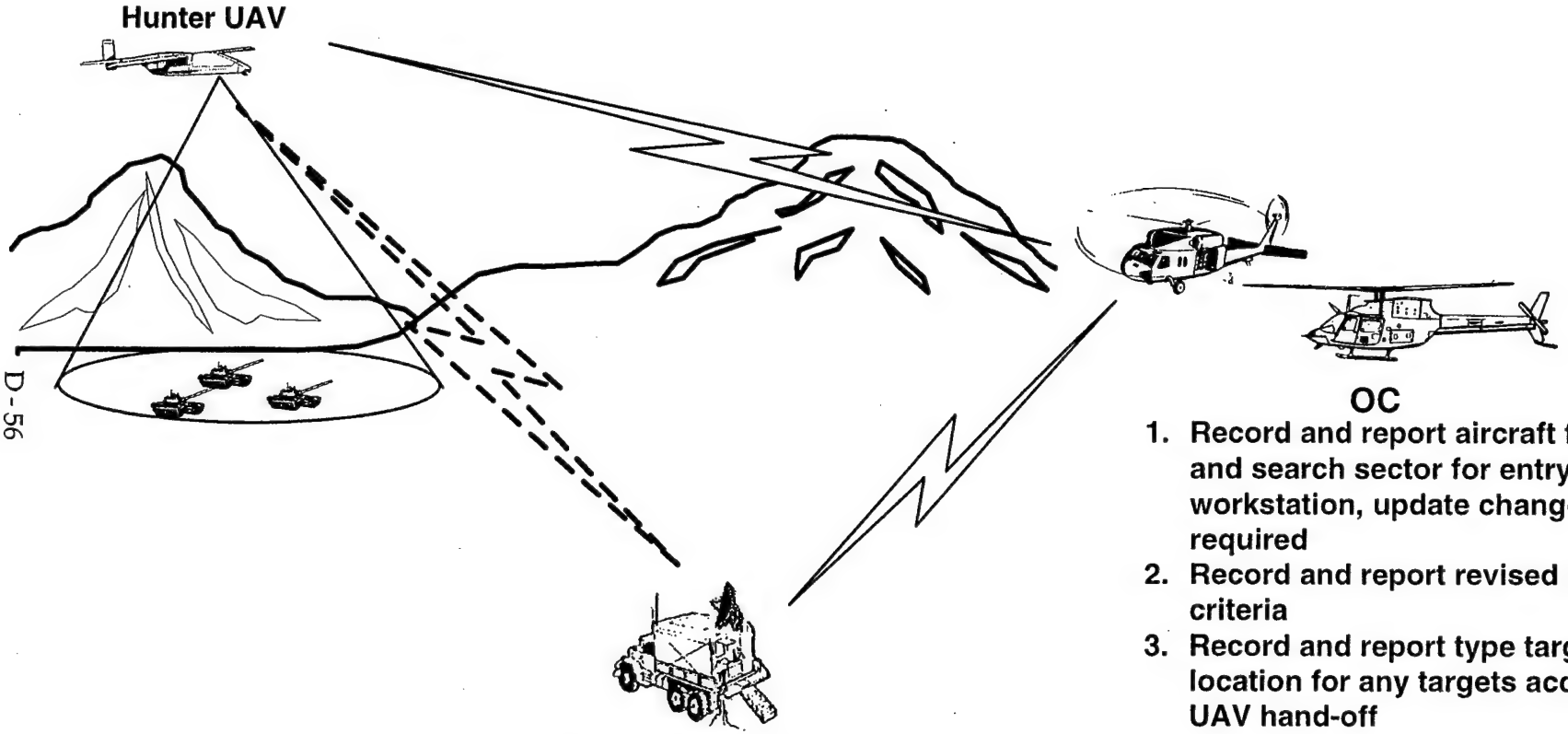
Ground Control Station

- O - System ID
- O - System location
- O - System range capability
- O - UAV ID
- O - UAV location
- O - UAV flight plan
- O - Go/No Go on Hand-off procedures

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Bird Dog UAV

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:



OC

1. **Record and report aircraft flight plan and search sector for entry into TAF workstation, update changes as required**
2. **Record and report revised UAV search criteria**
3. **Record and report type target and location for any targets acquired after UAV hand-off**

OC

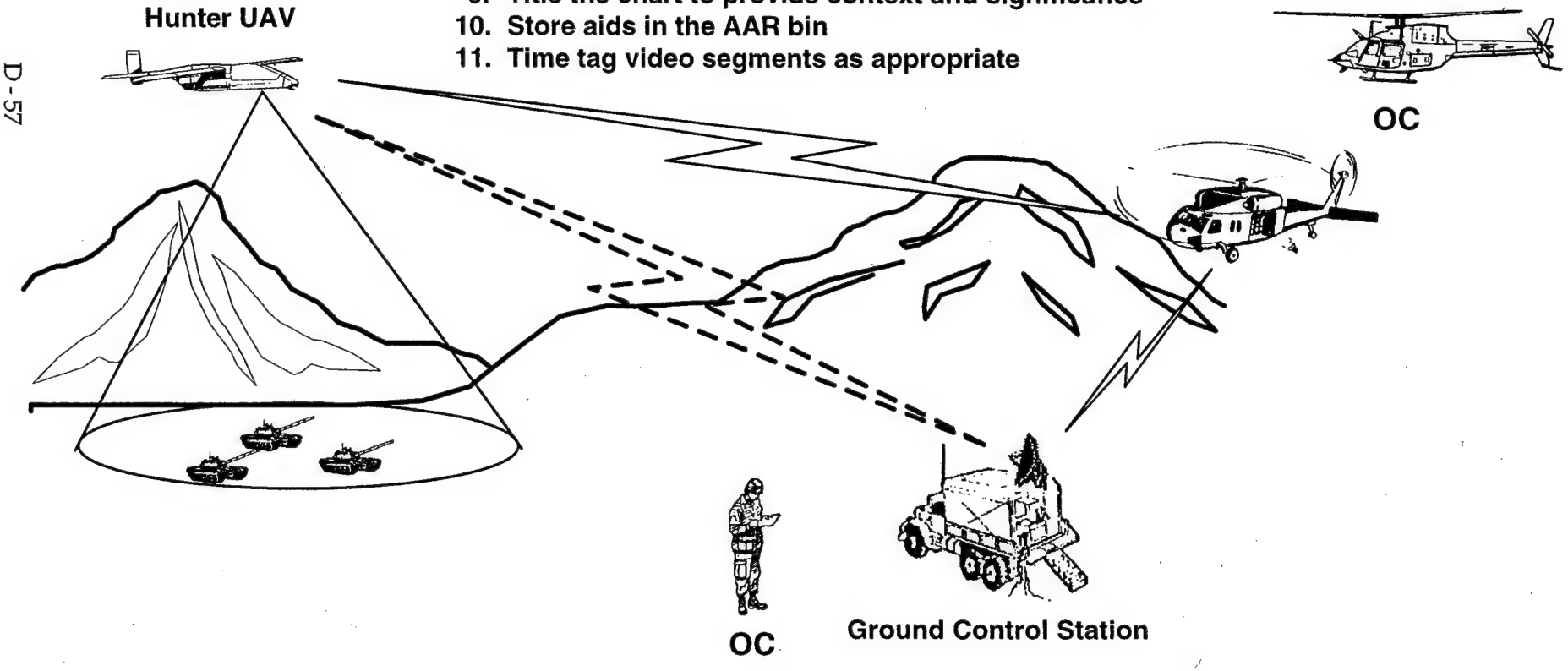
1. **Record and report System ID, Location, and range capability**
2. **Record and report UAV flight plan and search sector for entry into TAF workstation, update changes as required**
3. **Record and report UAV search criteria**
4. **Record and report type target and location for any targets UAV acquired**

Extrinsic Feedback Functions: Bird Dog UAV

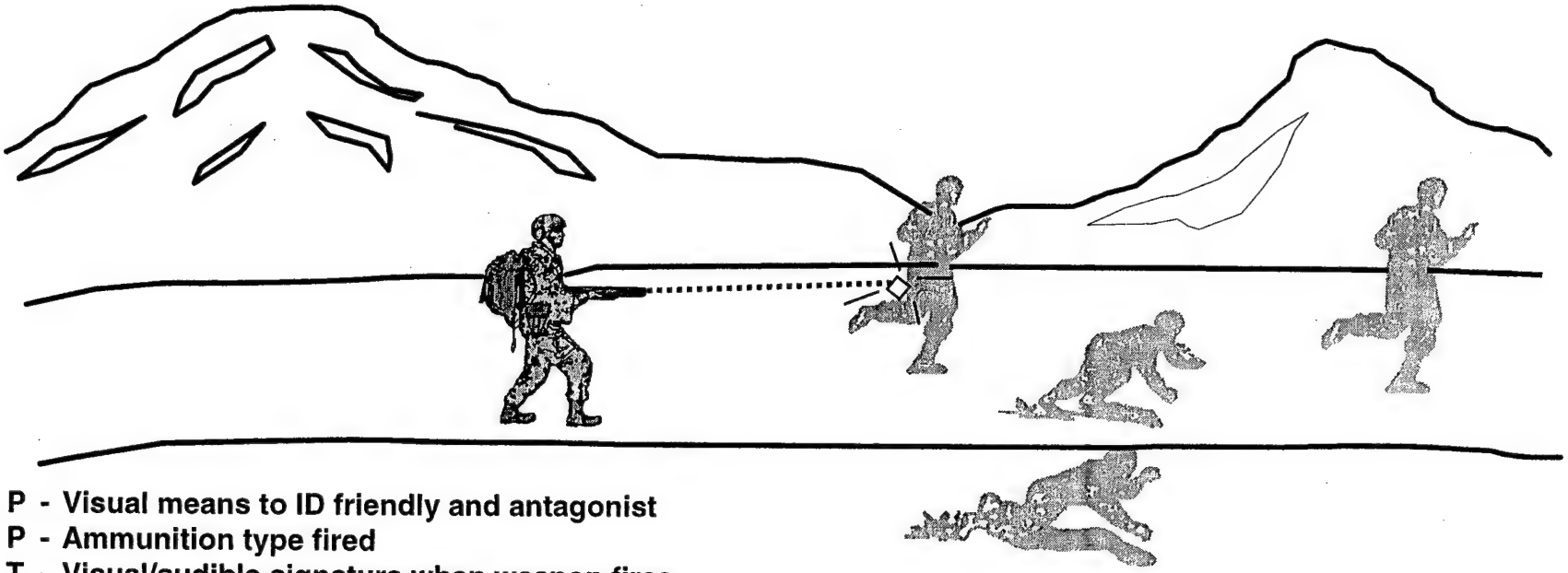
OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record detection engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin
11. Time tag video segments as appropriate



Intrinsic Feedback: 12-Gauge Round (Bean Bag)

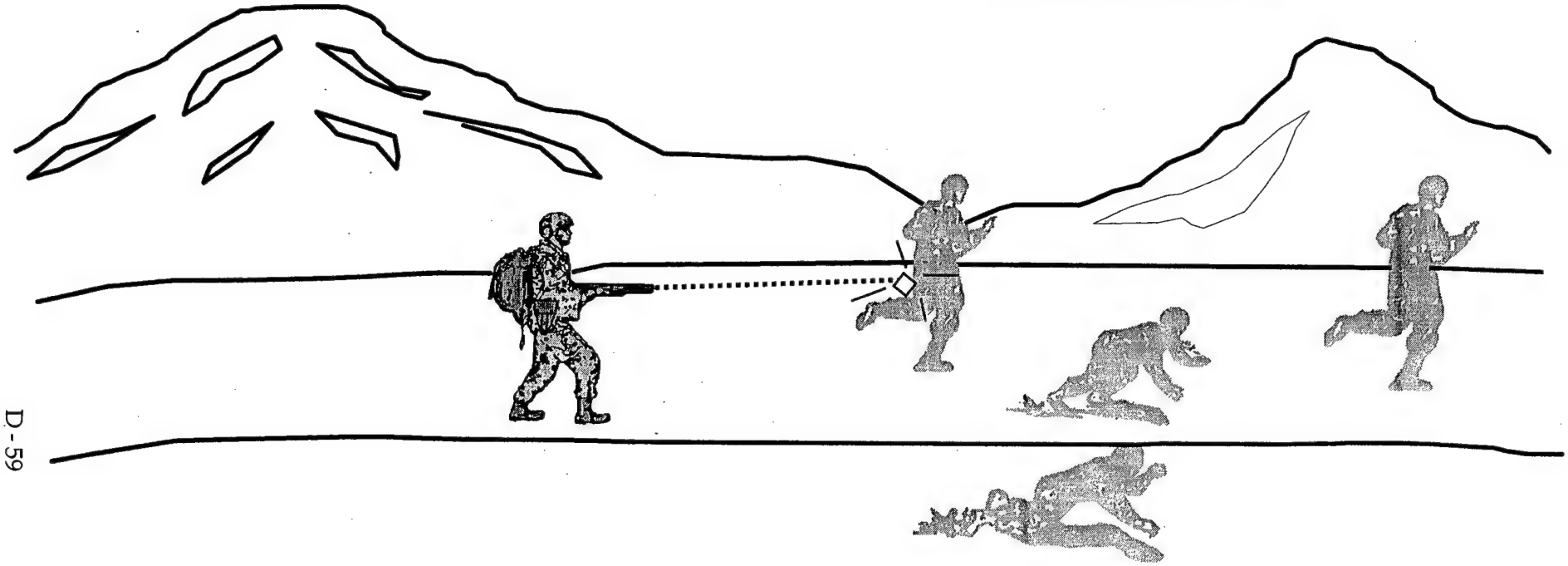


P - Visual means to ID friendly and antagonist
P - Ammunition type fired
T - Visual/audible signature when weapon fires
T - Location of impacting ordnance (direct hits only)
Visual indication of effects on antagonist
  P - Combat effective
  P - Out of action
N - Location of impacting ordnance (other than direct hits)

T - Visual signature of weapon shooting
T - Audible indication of impacting ordnance (direct hits only)
T - Audible indication of Near Miss
T - Out of action for MILES engagements
Visual/audible indication of ordnance effects:
  T - Combat effective
  T - Out of action
  P - WIA (Type wounds)
O - Out of action for control gun assessments
N - Type ordnance fired
N - Visual/audible indication of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

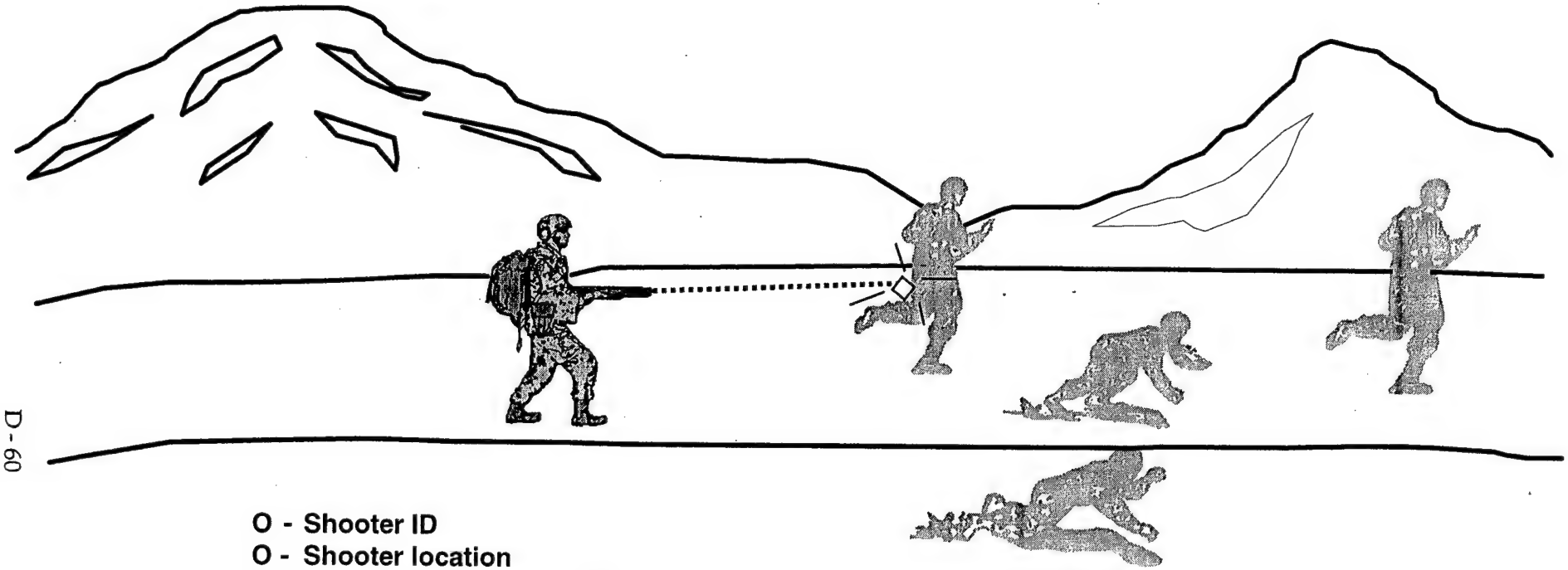
Intrinsic Feedback Functions: 12-Gauge Round (Bean Bag)



OC

1. Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)
2. Resurrect WIA's after incapacitation wears off

Extrinsic Feedback: 12-Gauge Round (Bean Bag)



O - Shooter ID
O - Shooter location
O - Pairing of shooter to victim for control gun assessments
N - Pairing of shooter to victim for MILES engagements
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES
N - Location of shooter and victim when inter-visible and exposure time

O - Victim ID
O - Victim location
Victim status:
- O - Combat effective
- O - Out of action
- O - WIA (Type wounds)

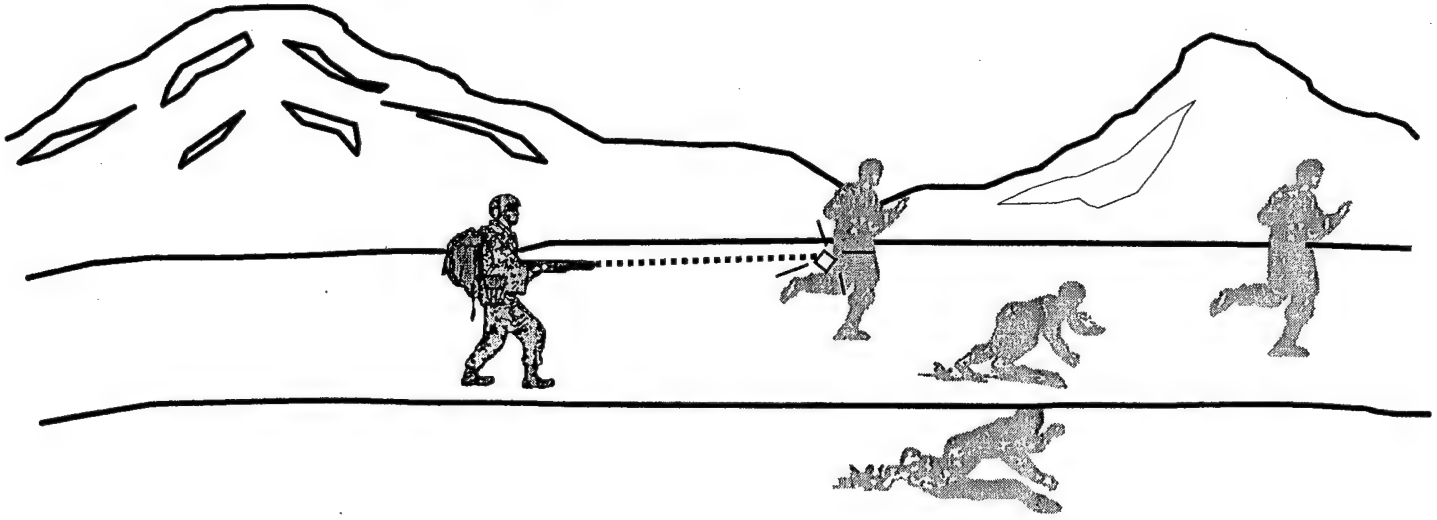
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: 12-Gauge Round (Bean Bag)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

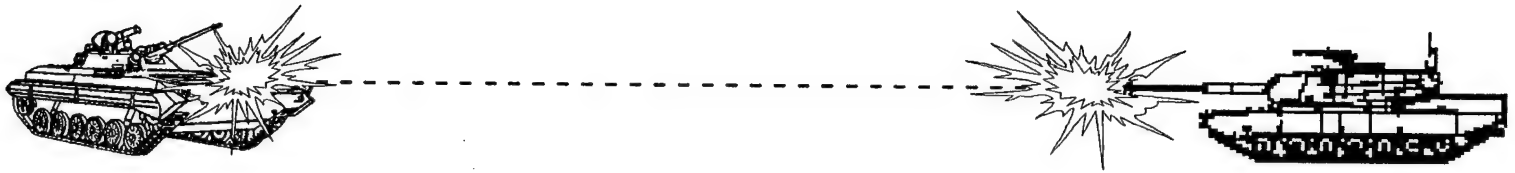
1. Record engagement information received from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFO perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin



OC

1. Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, and WIA type wounds)
2. Record and report shooter ID and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)
3. Record and report number of WIA's incapacitated/resurrected

Intrinsic Feedback: Abrams Tank Main Gun (LOS)



T - Visual signature of weapon shooting
T - Visual/audible indication of impacting ordnance (direct hits only)
T - Visual/audible indication of Near Miss
T - Out of action for MILES engagements
O - Out of action for control gun assessments
Visual/audible indication of ordnance effects:
- T - Fully operational
- T - Catastrophic kill
- T - Mobility kill
- T - Firepower kill
- T - Communications kill
- P - Type combat damage

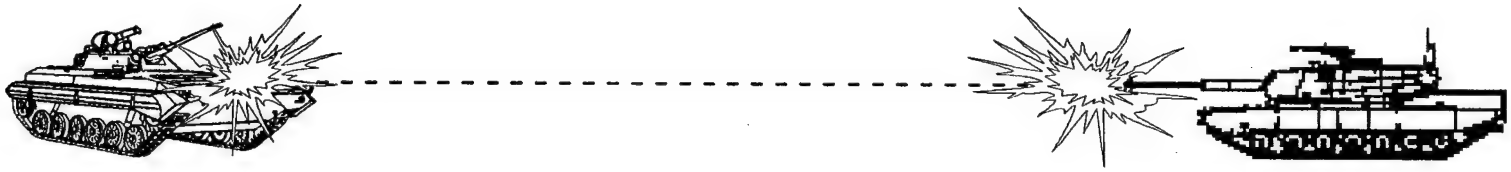
N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
Visual indication of ordnance effects
- P - Fully operational
- P - Catastrophic kill
- P - Mobility kill
- P - Firepower kill

T - Visual/audible signature when weapon fires
T - Location of impacting ordnance (direct hits only)
N - Location of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

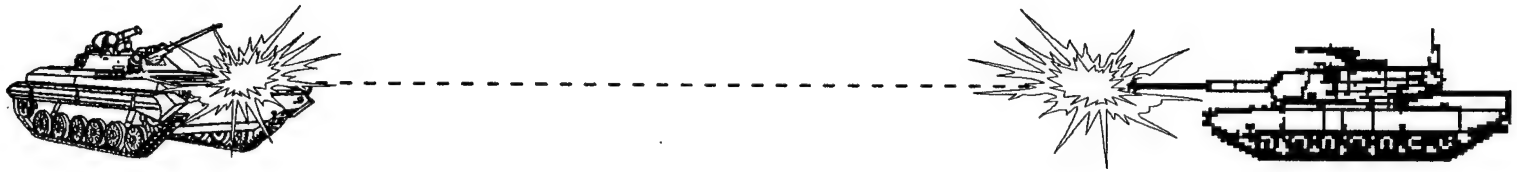
Intrinsic Feedback Functions: Abrams Tank Main Gun (LOS)



OC

1. Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

Extrinsic Feedback: Abrams Tank Main Gun (LOS)



I - Victim ID
I - Victim location
Victim status:
- I - Fully operational
- I - Catastrophic kill
- I - Mobility kill
- I - Firepower kill
- I - Communications kill
- O - Type combat damage

O - Hit/Kill aspect angle
O - Kill code

I - Shooter ID
I - Shooter location
I - Weapon ranging capability
O - Pairing of shooter to victim for control gun assessments
N - Pairing of shooter to victim for MILES engagements
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES
N - Location of shooter and victim when inter-visible and exposure time

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions : Abrams Tank Main Gun (LOS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

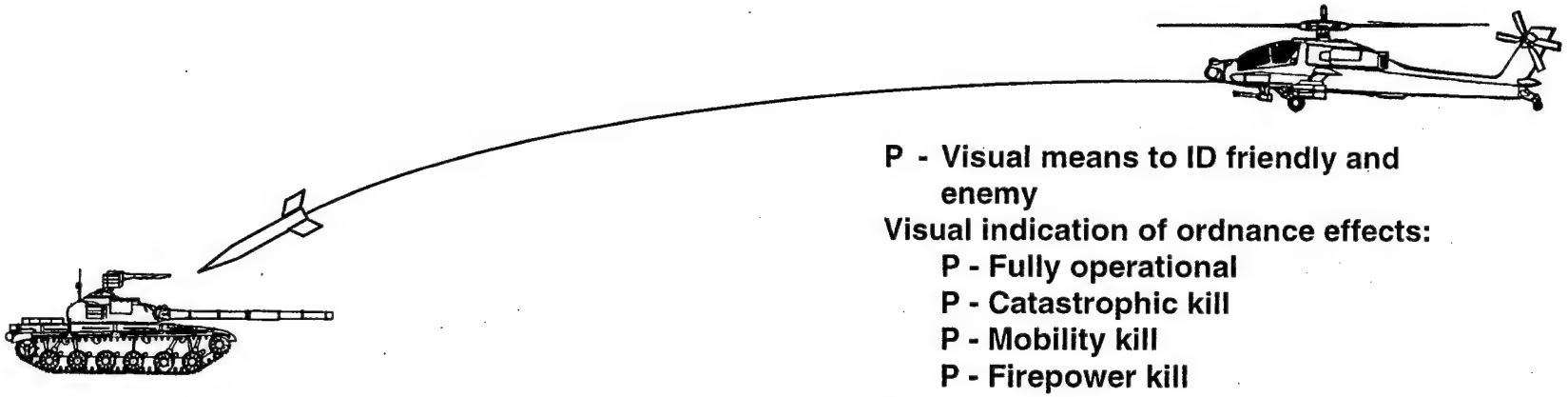
TAF Analyst

1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate
12. Time tag video segments as appropriate

OC

1. Obtain and record "kill codes," Hit/Kill aspect angle, and type combat damage for BLUFOR victims
2. Obtain and record "kill codes" for OPFOR victims
3. Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations and close-in engagements)

Intrinsic Feedback: Apache AH-64A HELLFIRE (LOS)



T - Visual signature of weapon shooting
T - Visual/audible indication of impacting ordnance (direct hits only)
T - Visual/audible indication of Near Miss
T - Out of action for MILES engagements
O - Out of action for control gun assessments
Visual/audible indication of ordnance effects:
- T - Fully operational
- T - Catastrophic kill
- T - Firepower kill
- T - Mobility kill
- T - Communications kill
- P - Type combat damage

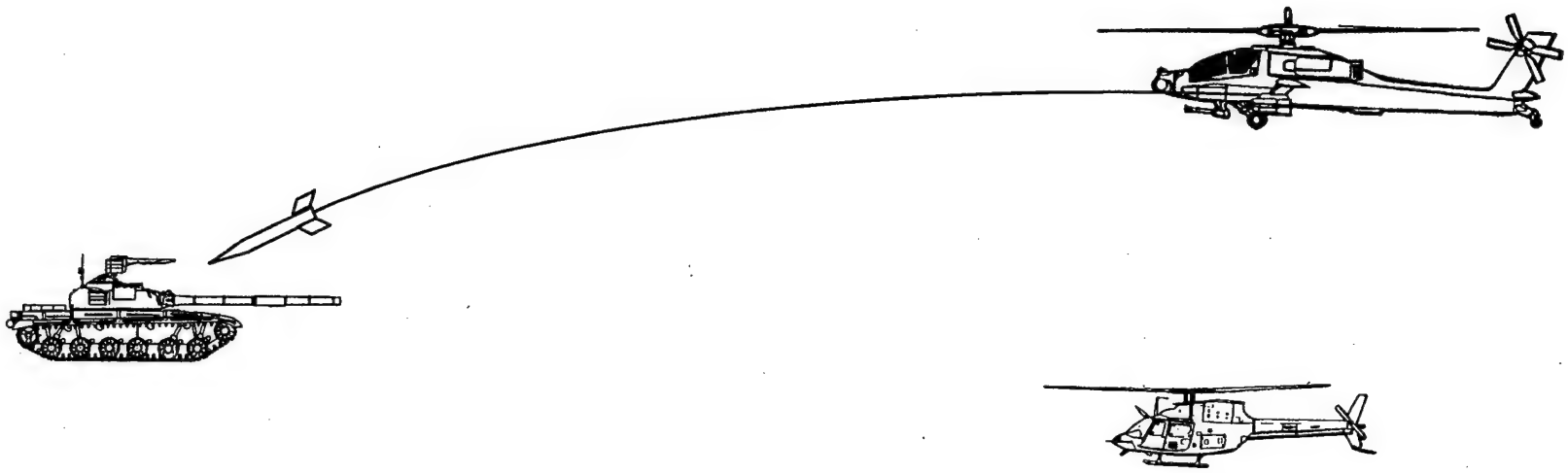
N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
Visual indication of ordnance effects:
- P - Fully operational
- P - Catastrophic kill
- P - Mobility kill
- P - Firepower kill

T - Visual signature when weapon fires
T - Location of impacting ordnance (direct hits only)
T - Aircraft survivability equipment on or off
N - Audible signature when weapon fires
N - Visual indication of missile(s) trajectory
N - Location of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

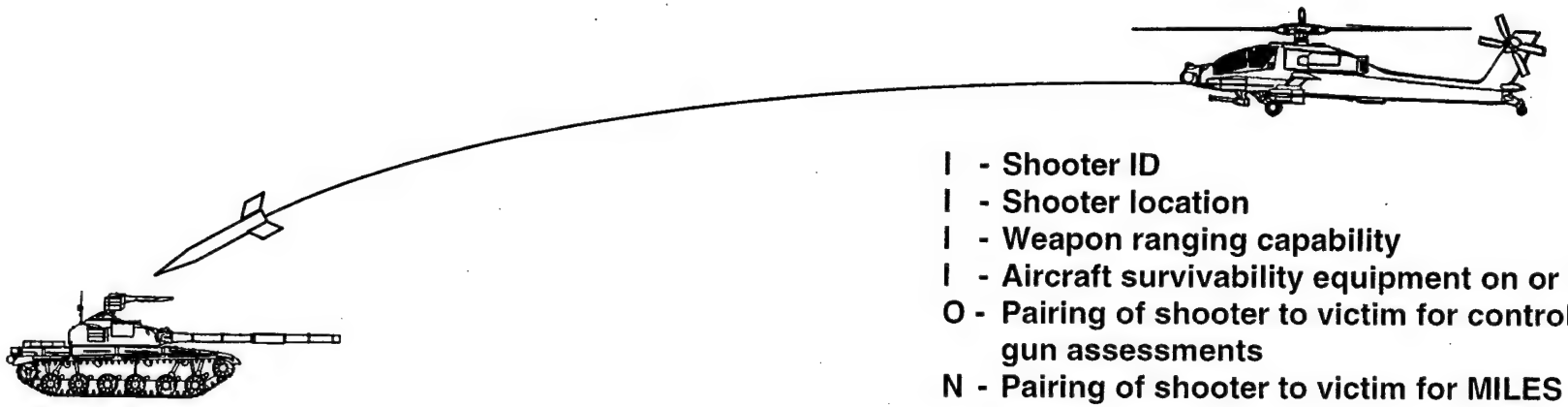
Intrinsic Feedback Functions: Apache AH-64A HELLFIRE (LOS)



OC

1. Manually adjudicate battle damage and casualties for MILES/AGES II limitations (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

Extrinsic Feedback: Apache AH-64A HELLFIRE (LOS)



I - Shooter ID
I - Shooter location
I - Weapon ranging capability
I - Aircraft survivability equipment on or off
O - Pairing of shooter to victim for control gun assessments
N - Pairing of shooter to victim for MILES engagements
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES
N - Location of shooter and victim when inter-visible and exposure time

I - Victim ID
I - Victim location
Victim status:
- I - Fully operational
- I - Catastrophic kill
- I - Mobility kill
- I - Firepower kill
- I - Communications kill
- O - Type combat damage

O - Hit/Kill aspect angle
O - Kill code

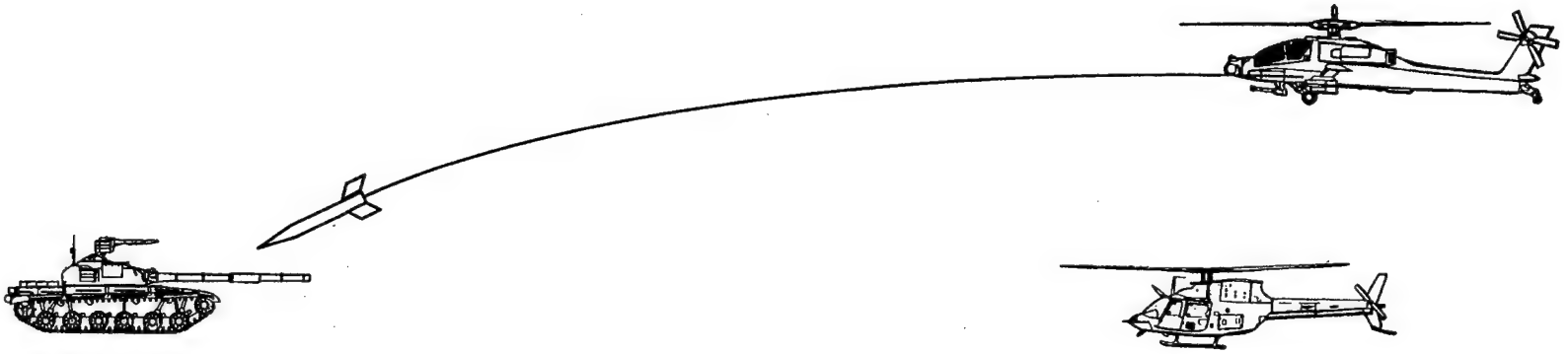
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Apache AH-64A HELLFIRE (LOS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

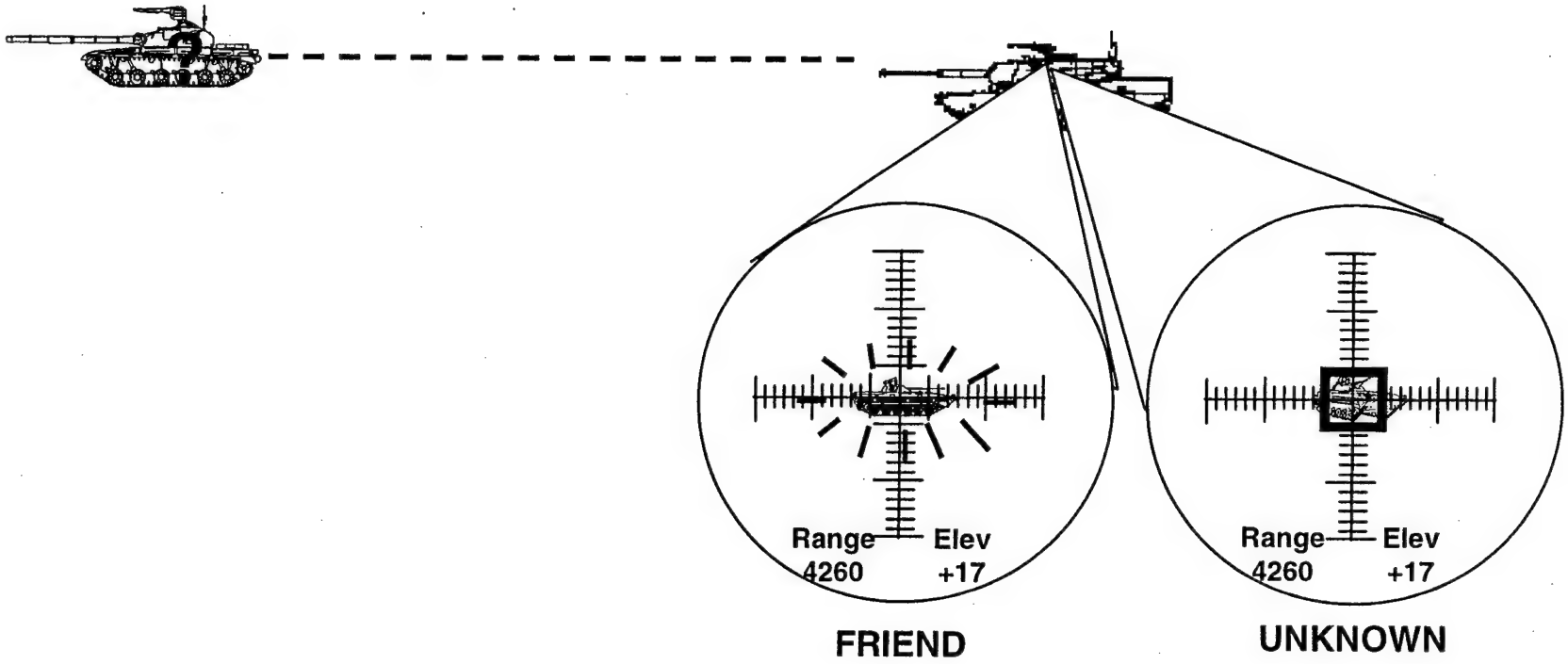
1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate



OC

1. Obtain and record "kill codes," hit/Kill aspect angle, and type combat damage for BLUFOR victims
2. Obtain and record "kill codes" for OPFOR victims
3. Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

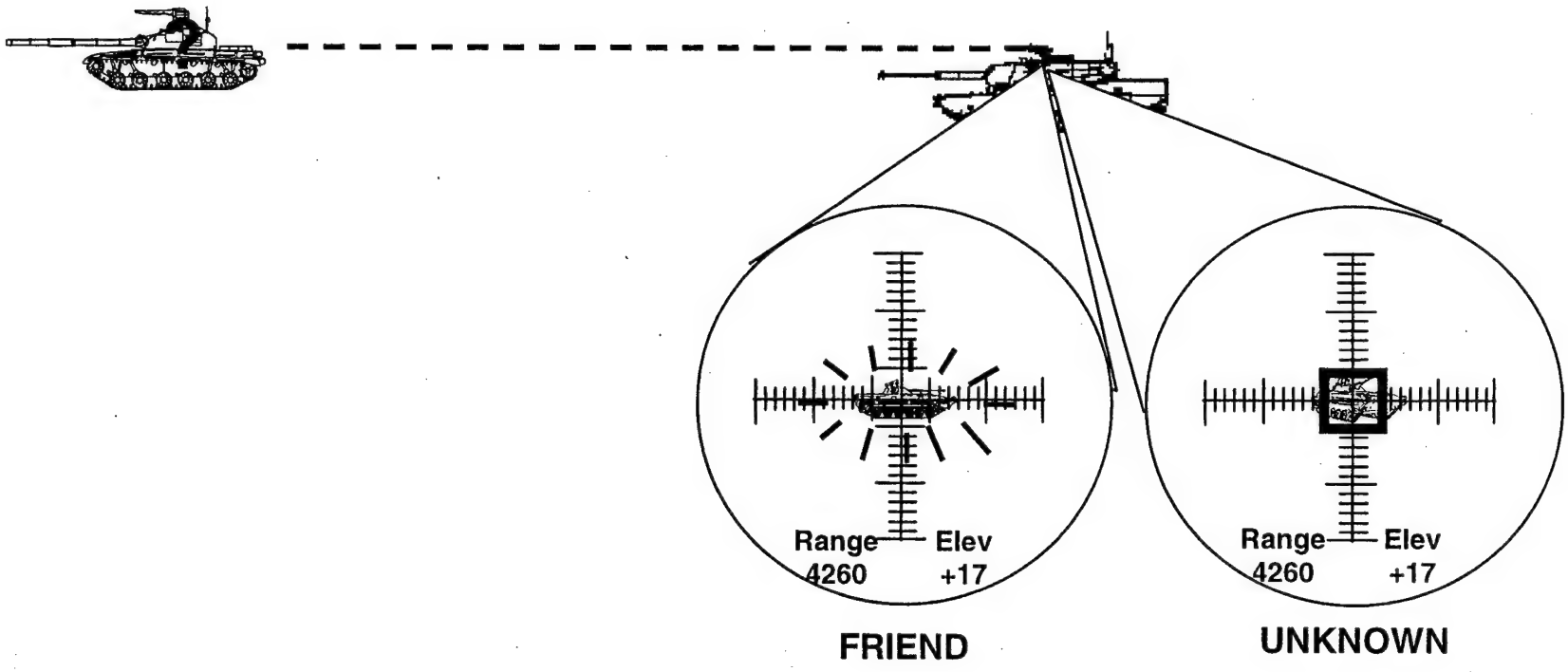
Intrinsic Feedback: Battle Combat Identification System (BCIS)



P - Players receive feedback from their actions

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

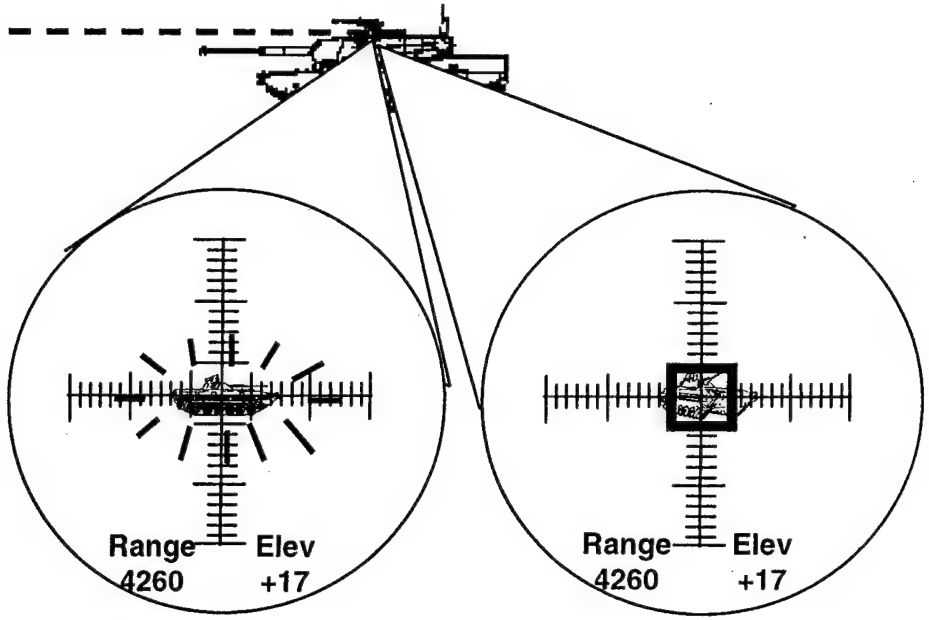
Intrinsic Feedback Functions: Battle Combat Identification System (BCIS)



NO OC or TAF analyst control functions needed. Players interactions with tactical equipment meet all intrinsic feedback requirements.

Extrinsic Feedback: Battle Combat Identification System (BCIS)

I - Victim ID
I - Victim location
Victim status:
- I - Fully operational
- I - Catastrophic kill
- I - Mobility kill
- I - Firepower kill
- I - Communications kill
- O - Type combat damage



FRIEND UNKNOWN

- I - Shooter ID
- I - Shooter location
- I - Weapon ranging capability
- O - Pairing of shooter to victim for control gun assessments
- N - Results of BCIS query
- N - Pairing of shooter to victim for MILES engagements
- N - Pairing of shooter to MISSES

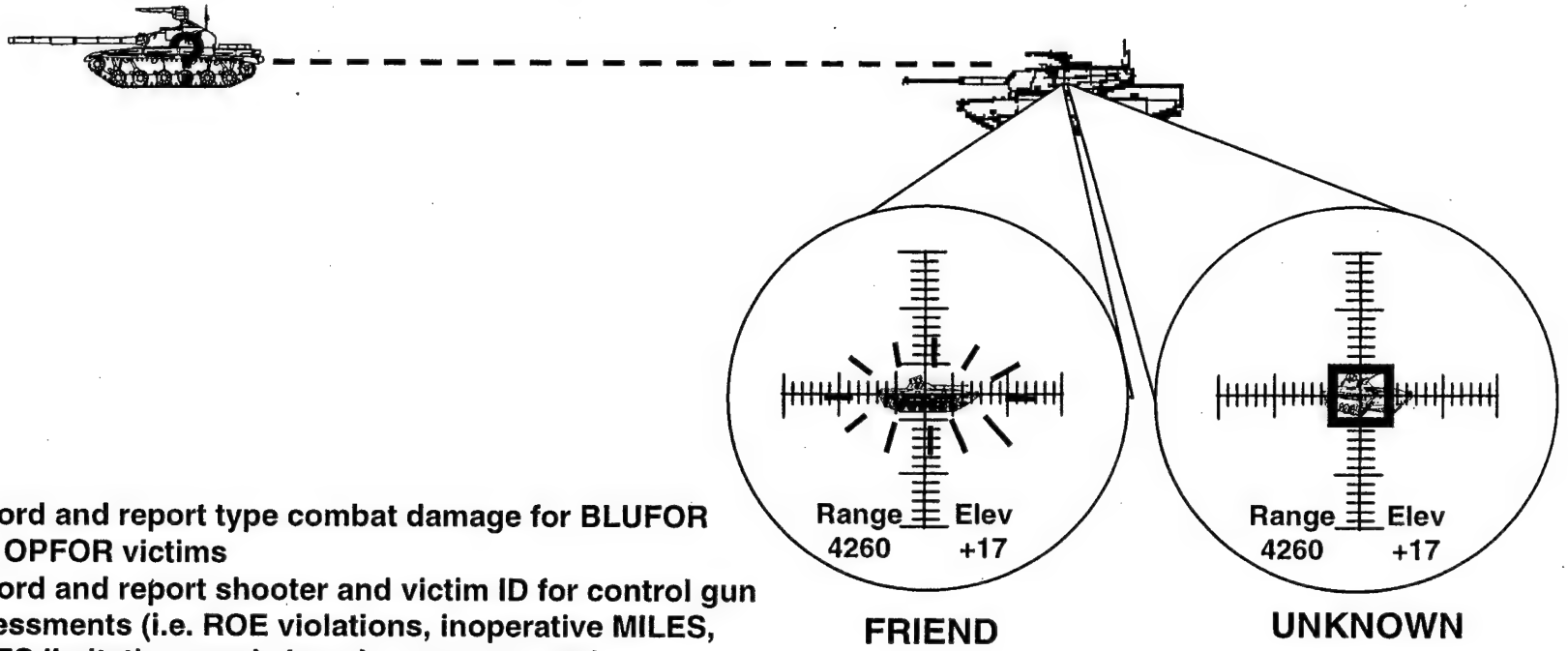
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Battle Combat Identification System (BCIS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record engagement information from OC
2. Locate required RSTA detection in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing detection results
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate



OC

1. Record and report type combat damage for BLUFOR and OPFOR victims
2. Record and report shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations and close-in engagements)

Intrinsic Feedback: Land Warrior System (LOS)

VICTIM

T - Visual signature of weapon shooting
T - Audible indication of impacting ordnance (direct hits only)
T - Audible indication of Near Miss
T- Out of action for MILES engagements
Audible indication of ordnance effects:
- T - Combat Effective
- T - Out of Action
- P - WIA (Type wounds)
- P - KIA
- N - Firepower kill
- N - C4I kill

O - Out of action for control gun assessments
N- Visual/audible indication of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

SHOOTER

P - Visual means to ID friendly and enemy
P - Common Picture (Enemy units, Friendly units)
P - Situation Maps
P - Digitized Terrain and Elevation Data
P - Target handoff
P - Direct Interaction with Fire Support Assets
P - OPORDS
P - FRAGOS
P - Overlays
T - Visual/audible signature when weapon fires.
Visual indication of ordnance effects:
- P - Combat Effective
- P - Out of action

N - Location of impacting ordnance (other than direct hits)

Intrinsic Feedback Functions: Land Warrior System (LOS)

OC

1. **Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitations, and Close-in engagements)**

Extrinsic Feedback: Land Warrior System (LOS)

VICTIM

O - Victim ID
O - Victim Location
Victim status:
- O - Combat Effective
- O - Out of action
- O - WIA (Type wounds)
- O - KIA
- N - Firepower kill
- N - C4I kill

N - Kill code

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

SHOOTER

O - Shooter ID
O - Shooter location
O - Weapon ranging capability
O - Pairing of shooter to victim for control gun assessments
N - Pairing of shooter to victim for MILES engagements
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES

Extrinsic Feedback Functions: Land Warrior System (LOS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate

OC

1. Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, type wounds for WIA, and KIA)
2. Record and report shooter ID and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

Intrinsic Feedback: Land Warrior System (NLOS)

VICTIM

N - Audible indication of impacting ordnance (direct hits only)
N - Audible indication of Near Miss
Audible indication of ordnance effects:
- N - Combat effective
- N - Out of action
- N - WIA (Type wounds)
- N - KIA
- N - Firepower kill
- N - C4I kill

N - Visual/audible indication of impacting ordnance (other than direct hits)

SHOOTER

P - Visual means to ID friendly and enemy
P - Common Picture (Enemy units, Friendly units)
P - Situation Maps
P - Digitized Terrain and elevation data
P - Target handoff
P - Direct Interaction with Fire Support Assets
P - OPORDS
P - FRAGOS
P - Overlays
T - Visual/audible signature when weapon fires

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Land Warrior System (NLOS)

No OC or TAF analyst control functions needed. Current TES/IS cannot simulate Land Warrior System when using NLOS capability.

Extrinsic Feedback: Land Warrior System (NLOS)

VICTIM

N - Victim ID
N - Victim location
Victim status:
- N - Combat effective
- N - Out of action
- N - WIA (Type wounds)
- N - KIA
- N - Firepower kill
- N - C4I kill

N - Kill code

SHOOTER

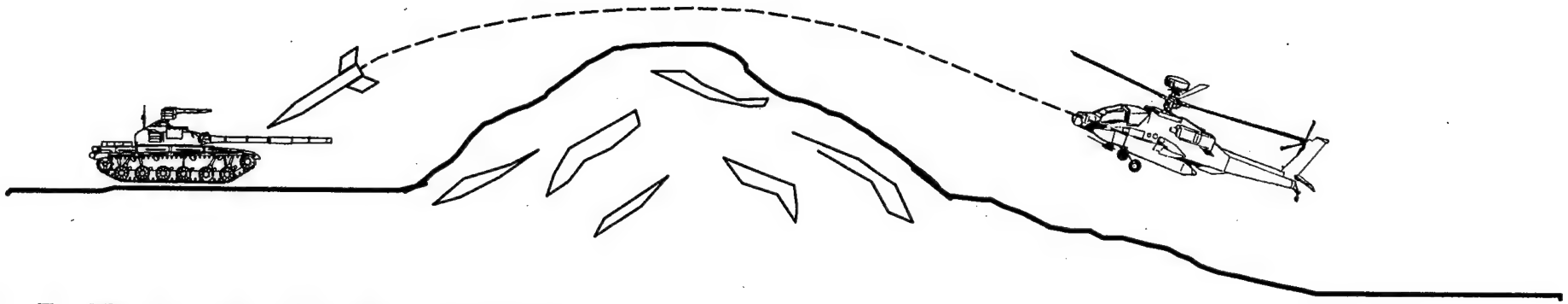
N - Shooter ID
N - Shooter location
N - Weapon ranging capability
N - Pairing of shooter to victim for MILES Engagements
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Land Warrior System (NLOS)

No OC or TAF analyst data collection functions tasks needed. Current TES/IS cannot simulate Land Warrior System when using NLOS capability.

Intrinsic Feedback: Apache AH-64D LONGBOW HELLFIRE (NLOS)



T - Visual/audible indication of impacting ordnance (direct hits only)
T - Visual/audible indication of Near Miss
O - Administrative resurrection due to TES limitations
Visual/audible indication of ordnance effects:
- T - Fully operational
- T - Catastrophic kill
- T - Mobility kill
- T - Firepower kill
- T - Communications kill
- P - Type combat damage

N - Visual/audible indication of impacting ordnance (other than direct hits)

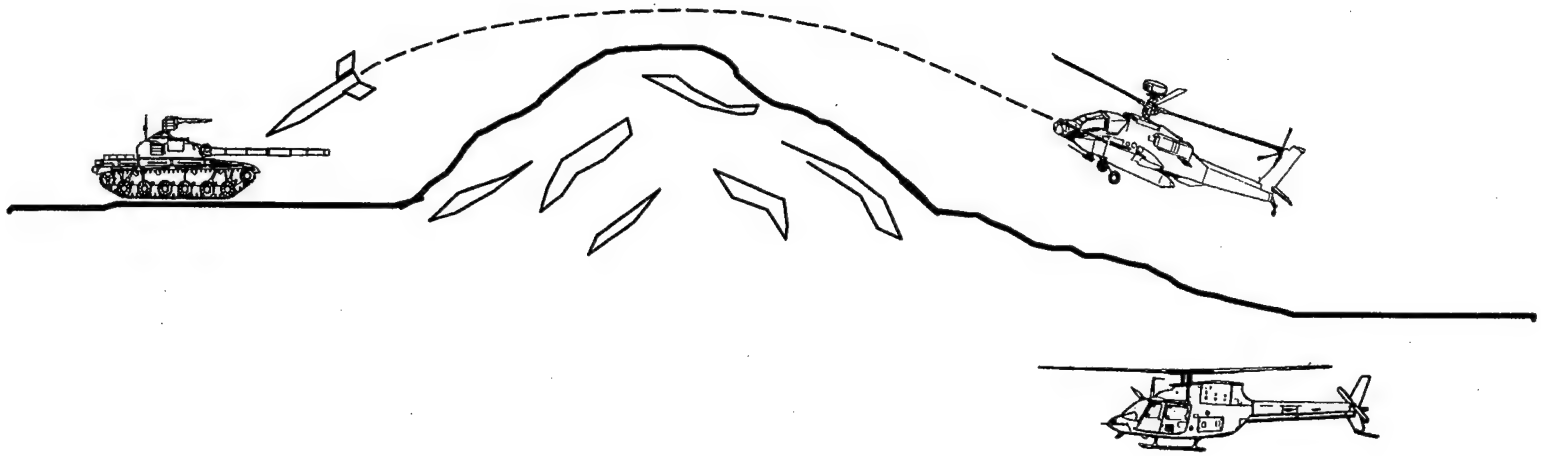
P - Visual means to ID friendly and enemy
T - Visual signature when weapon fires
T - Aircraft survivability equipment on or off
N - Visual indication of missile(s) trajectory
N - Audible signature when weapon fires
N - Location of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Apache AH-64D LONGBOW HELLFIRE (NLOS)

TAF Analyst

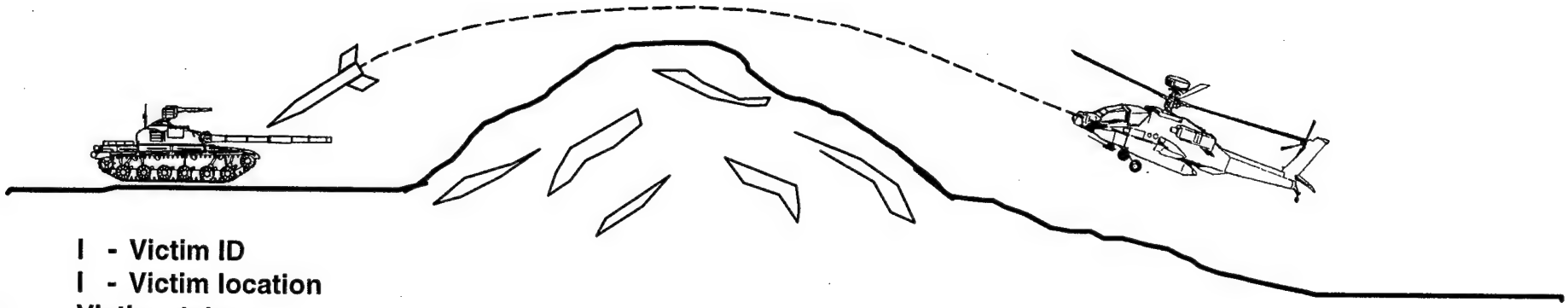
1. Observe CIS assessment of engagement on top down display, report results to OC
2. Inform OC of other engagements being conducted, that need observation as required
3. When number of vehicles killed exceeds number of missiles fired, resurrect vehicles accordingly from TAF



OC

1. Upon seeing FLASHWESS from AH-64D, OC coordinates with crew to determine target locations engaged and type ammunition fired
2. Receive engagement results from TAF analyst, if non-instrumented or non-tracking targets were properly engaged, direct OC closest to target location to administratively kill vehicle

Extrinsic Feedback: Apache AH-64D LONGBOW HELLFIRE (NLOS)



I - Victim ID
I - Victim location
Victim status:
- I - Fully operational
- I - Catastrophic kill
- I - Mobility kill
- I - Firepower kill
- I - Communications kill
- O - Type combat damage

O - Hit/Kill aspect angle
O - Kill code

I - Shooter ID
I - Shooter location
I - Weapon ranging capability
I - Aircraft survivability equipment on or off
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES
N - Location of shooter and victim when inter-visible and exposure time

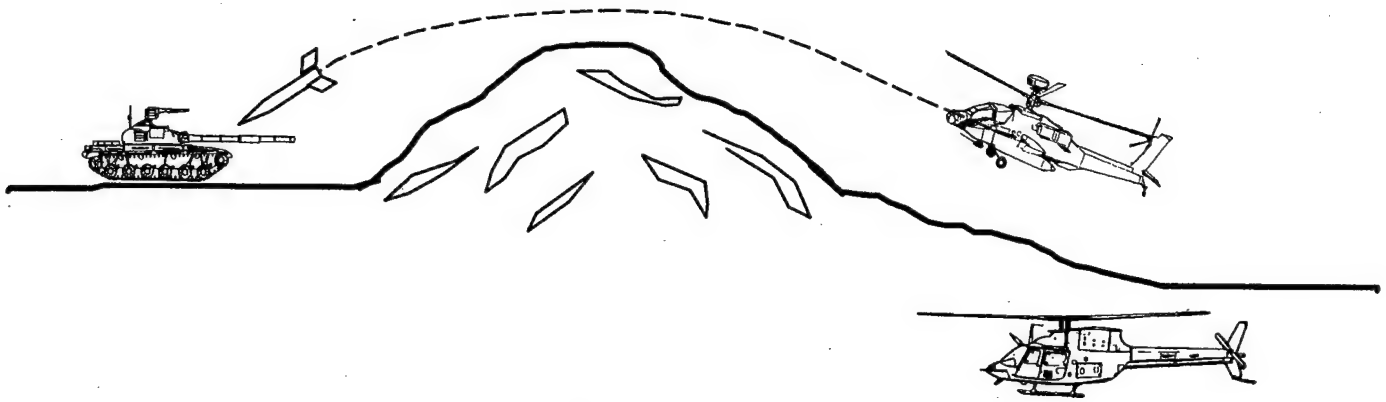
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Apache AH-64D LONGBOW HELLFIRE (NLOS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

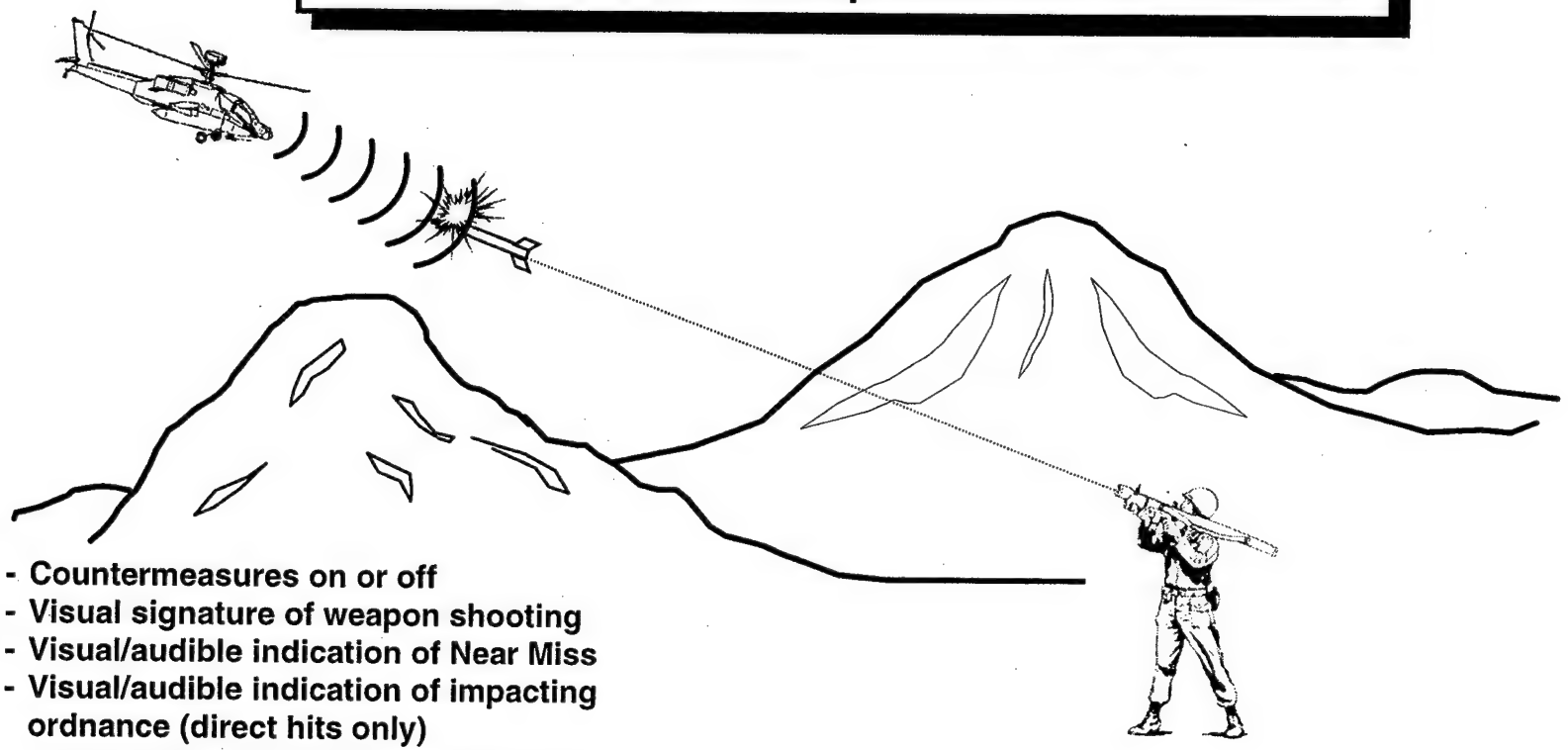
1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate



OC

1. Record and report OC assessed OPFOR kills
2. Obtain and record "kill codes," Hit/Kill aspect angle, and type combat damage for BLUFOR victims
3. Obtain and record "kill codes" for OPFOR victims
4. Record and report shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

Intrinsic Feedback: Multispectral Countermeasures



P - Countermeasures on or off
T - Visual signature of weapon shooting
N - Visual/audible indication of Near Miss
N - Visual/audible indication of impacting ordnance (direct hits only)
N - Out of action for MILES engagements
Visual/audible indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill
- N - Firepower kill
- N - Mobility kill
- N - Communications kill
- N - Type combat damage

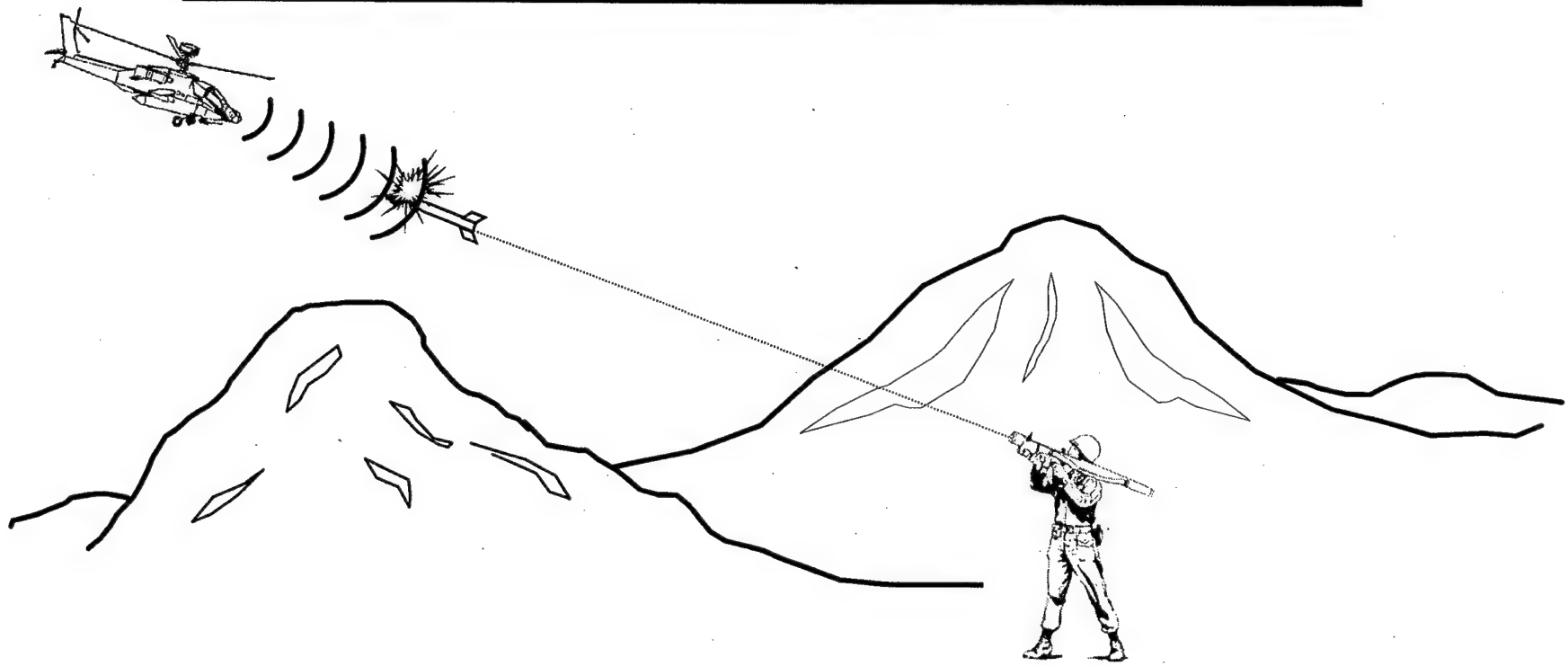
N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
T - Visual signature when weapon fires
Visual indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill

N - Visual indication of missile(s) trajectory

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Multispectral Countermeasures

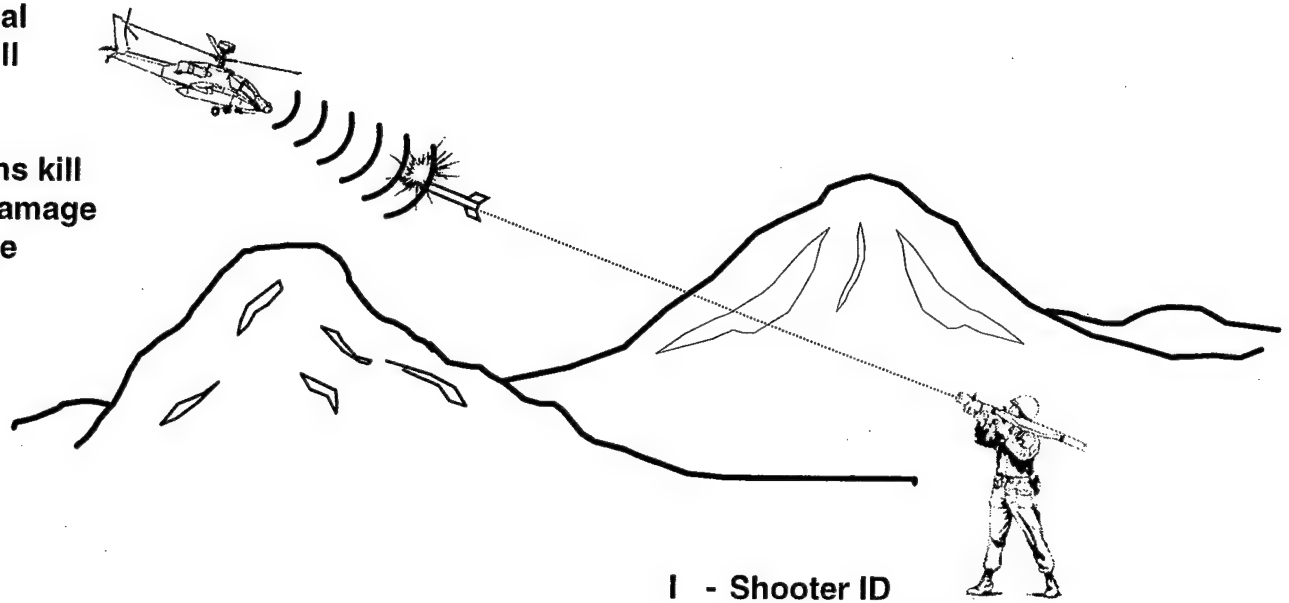


No OC or TAF analyst control functions needed. Current TES/IS cannot simulate Multispectral Countermeasure capability

Extrinsic Feedback: Multispectral Countermeasures

N - Countermeasures on or off
N - Victim ID
N - Victim location
Victim status:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill
- N - Communications kill
- N - Type combat damage

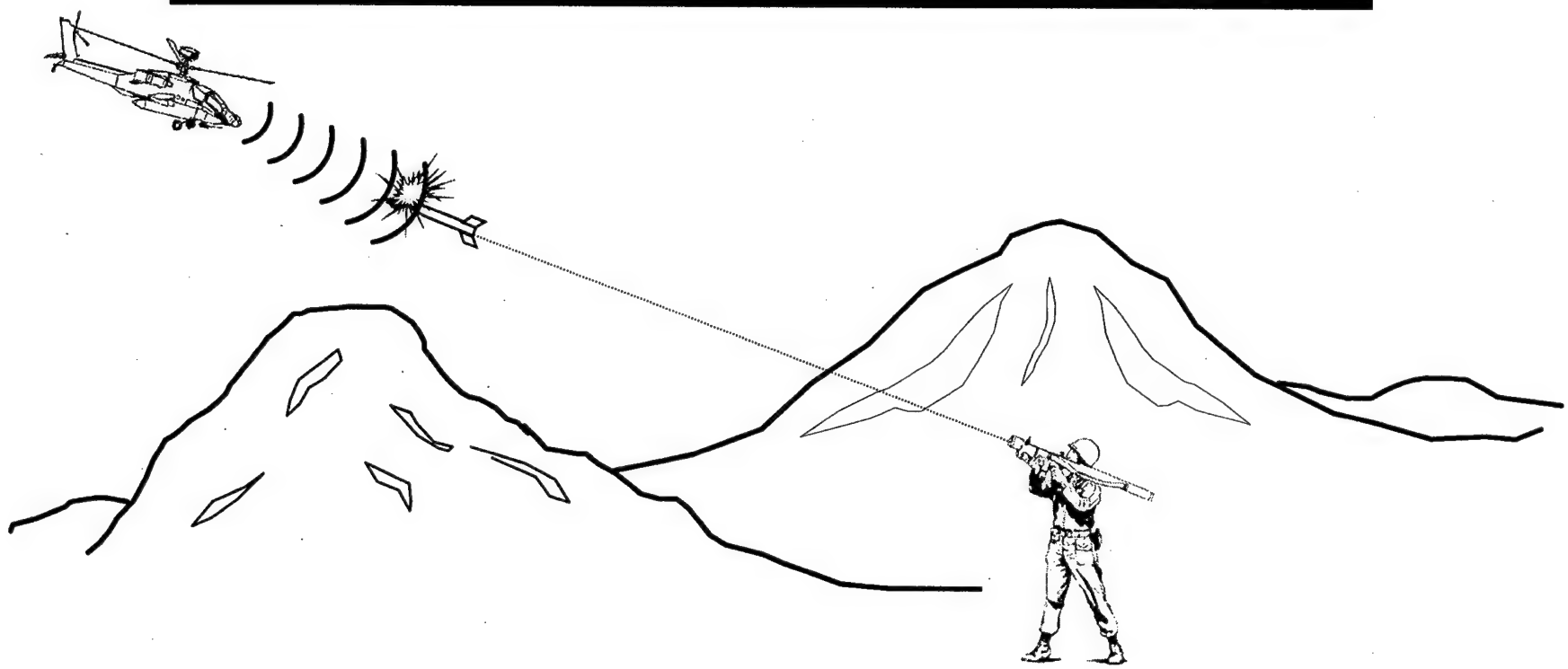
N - Hit/Kill aspect angle



I - Shooter ID
I - Shooter location
I - Weapon ranging capability
N - Pairing of shooter to victim for MILES engagements
N - Pairing of shooter to MISSES
N - Ammunition type and amount fired
N - Ammunition type and amount on hand
N - Location of shooter and victim when inter-visible and exposure time

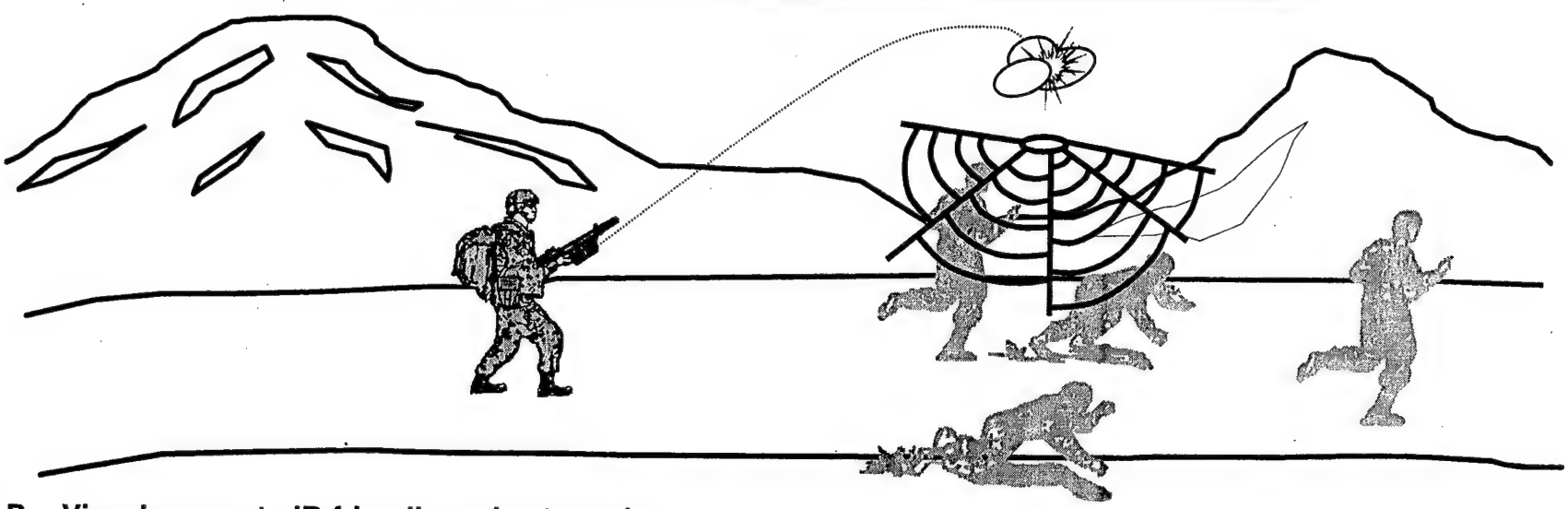
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Multispectral Countermeasures



No OC or TAF analyst data collection functions needed. Current TES/IS cannot simulate Multispectral Countermeasure capability

Intrinsic Feedback: Non-Lethal Entanglement



P - Visual means to ID friendly and antagonist
P - Ammunition type fired
Visual indication of effects on antagonist
- O - Combat effective
- O - Out of action

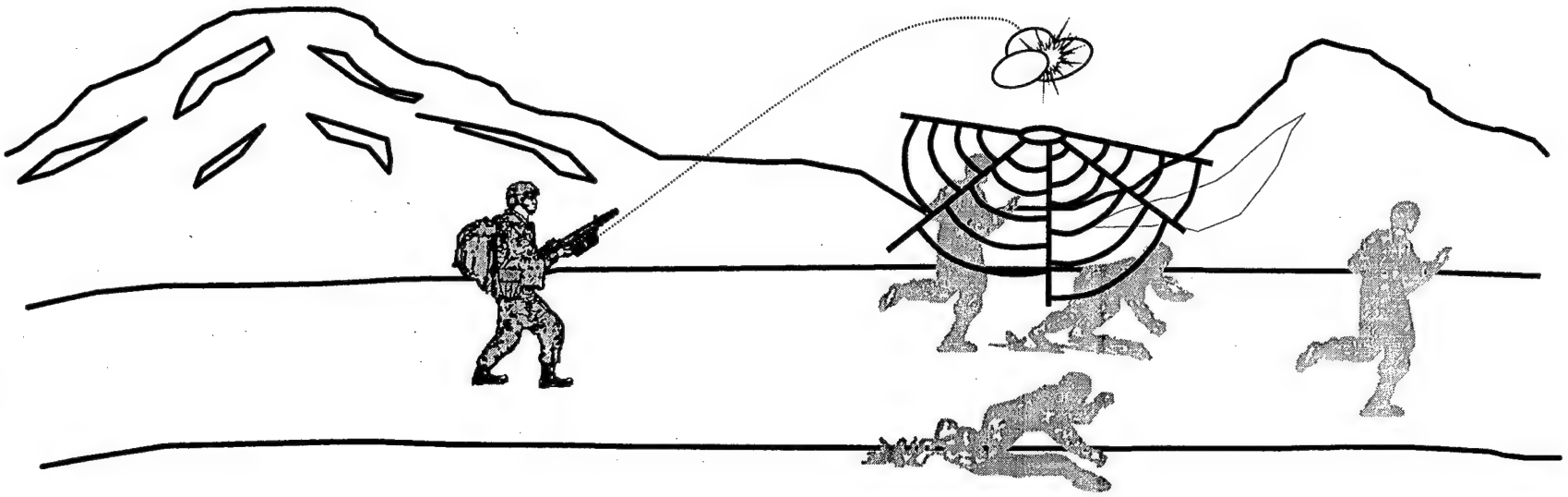
N - Visual/audible signature when weapon fires
N - Visual indication of deployed net

Victim degree of degradation:
- O - Combat effective
- O - Out of action
- O - WIA (Type wounds)

O - Out of action for control gun assessments
O - Audible indication of impacting ordnance (direct hits only)
O - Audible indication of Near Miss
N - Visual signature of weapon shooting
N - Type ordnance fired
N - Visual indication of deployed net

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

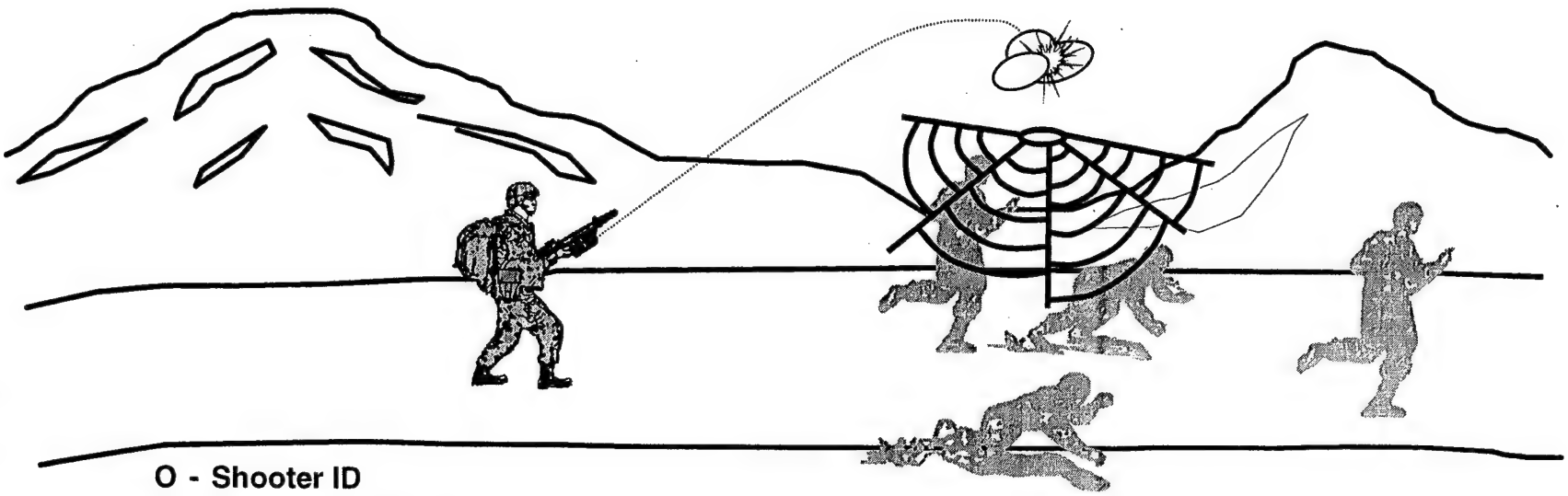
Intrinsic Feedback Functions: Non-Lethal Entanglement



OC

1. Coordinate with attacking soldier to determine intended victim(s) identification
2. Verify shooter amount and type ammunition on hand
3. Determine success of engagement based on radius of entanglement net and location of shooter and victim(s)
4. Use control gun to indicate NEAR MISS to victims as required
5. Execute control gun KILL to simulate WIA's (NON-LETHAL wounds) for antagonists within radius of net
6. Resurrect WIA's after appropriate time based on type net used (sticky or stinging)

Extrinsic Feedback: Non-Lethal Entanglement



O - Shooter ID
O - Shooter location
O - Pairing of shooter to victim(s) for control gun assessments
O - Ammunition type and amount on hand
O - Ammunition type and amount fired

O - Victim ID
O - Victim location
Victim status:
- O - Combat effective
- O - Out of action
- O - WIA (Type wounds)

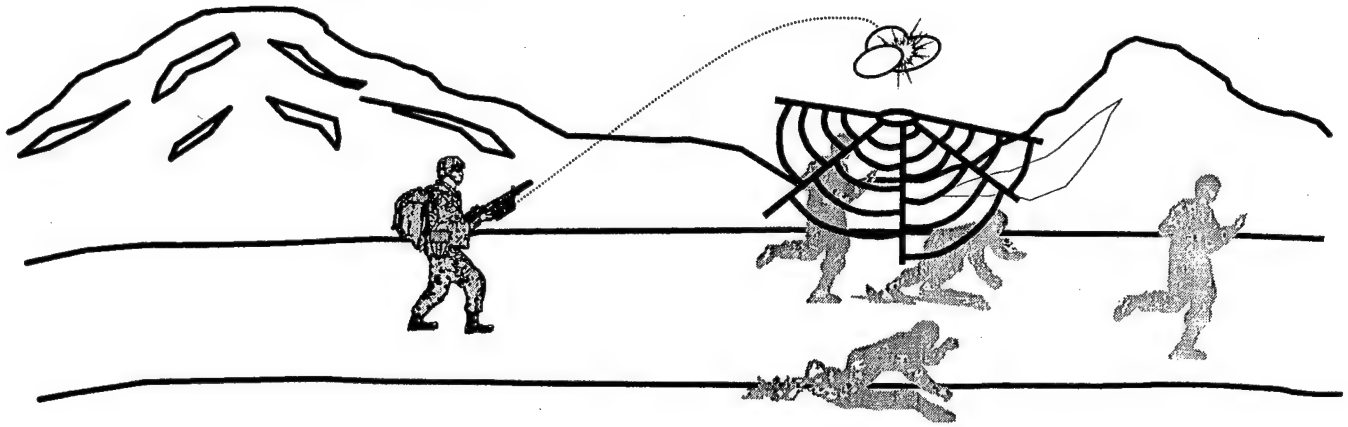
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Non-Lethal Entanglement

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

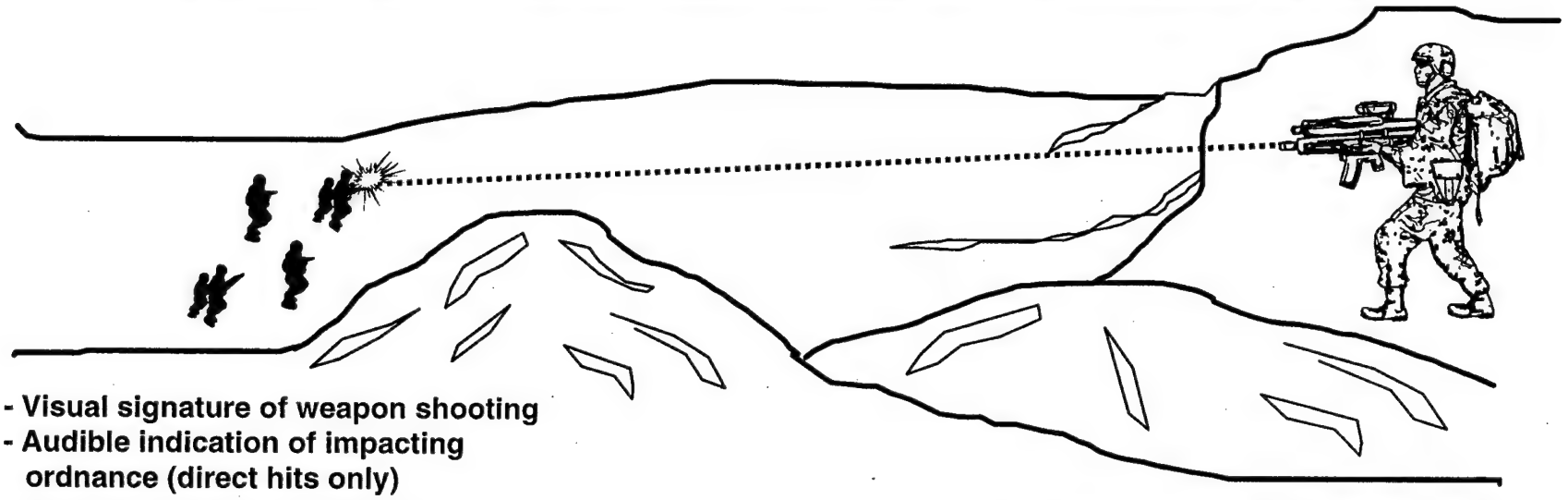
1. Record engagement information received from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Draw vector connecting shooter to victim
6. Identify and display appropriate BLUFOR control measures
7. Prepare a top down view AAR aid of the engagement
8. Title the AAR aid to provide context and significance
9. Prepare statistical attacker victim charts from OPFOR and BLUFOR perspectives
10. Title the chart to provide context and significance
11. Store aids in AAR bin



OC

1. Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, and WIA type wounds)
2. Record and report shooter ID and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)
3. Record and report pairing of shooter to victim
4. Record and report number of WIA's incapacitated/resurrected

Intrinsic Feedback: Objective Individual Combat Weapon (LOS)



T - Visual signature of weapon shooting
T - Audible indication of impacting ordnance (direct hits only)
T - Audible indication of Near Miss
T - Out of action for MILES engagements
O - Out of action for control gun assessments
Visual/audible indication of ordnance effects:
- T - Combat effective
- T - Out of action
- P - WIA (type wounds)
- P - KIA

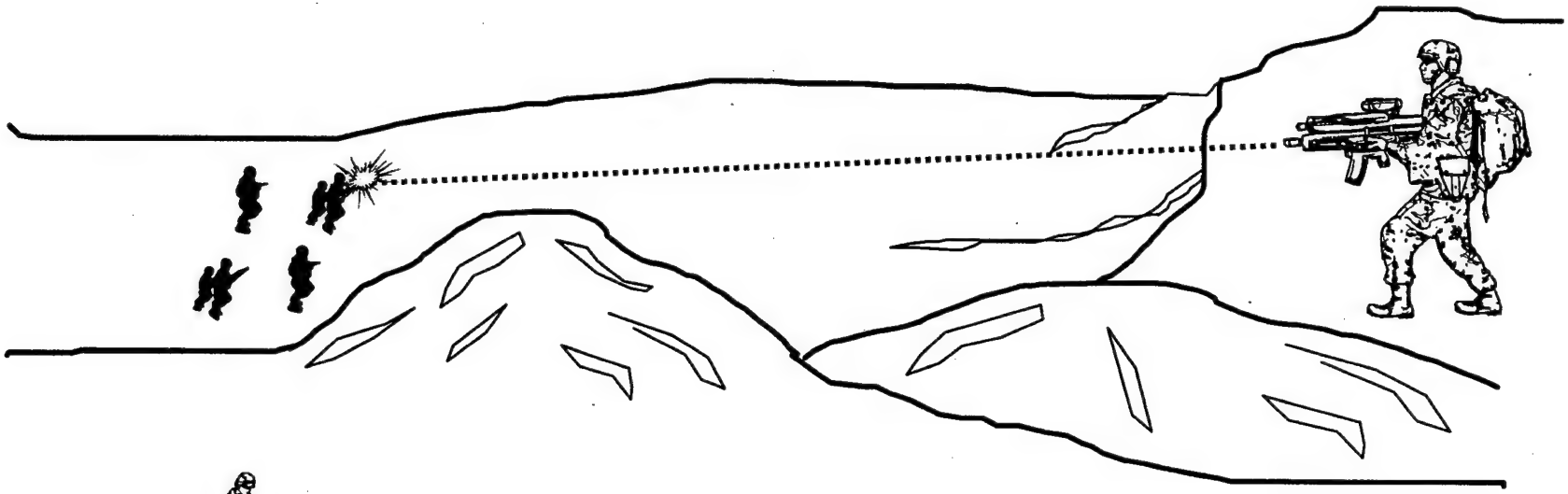
N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
Visual indication of ordnance effects:
- P - Combat effective
- P - Out of action

T - Visual/audible signature when weapon fires
N - Location of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

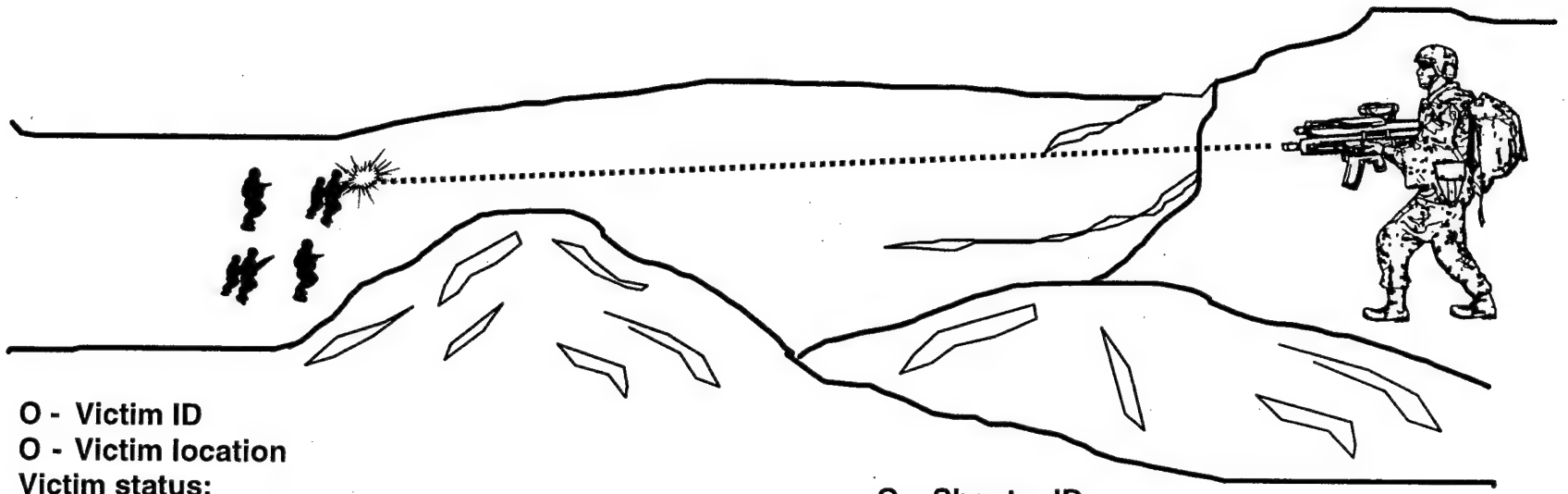
Intrinsic Feedback Functions: Objective Individual Combat Weapon (LOS)



OC

1. Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitation, and Close-in engagements)

Extrinsic Feedback: Objective Individual Combat Weapon (LOS)



O - Victim ID
O - Victim location
Victim status:
- O - Combat effective
- O - Out of action
- O - WIA (Type wounds)
- O - KIA

N - Kill code

O - Shooter ID
O - Shooter location
O - Weapon ranging capability
O - Pairing of shooter to victim for control gun assessments
N - Pairing of shooter to victim for MILES engagements
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES

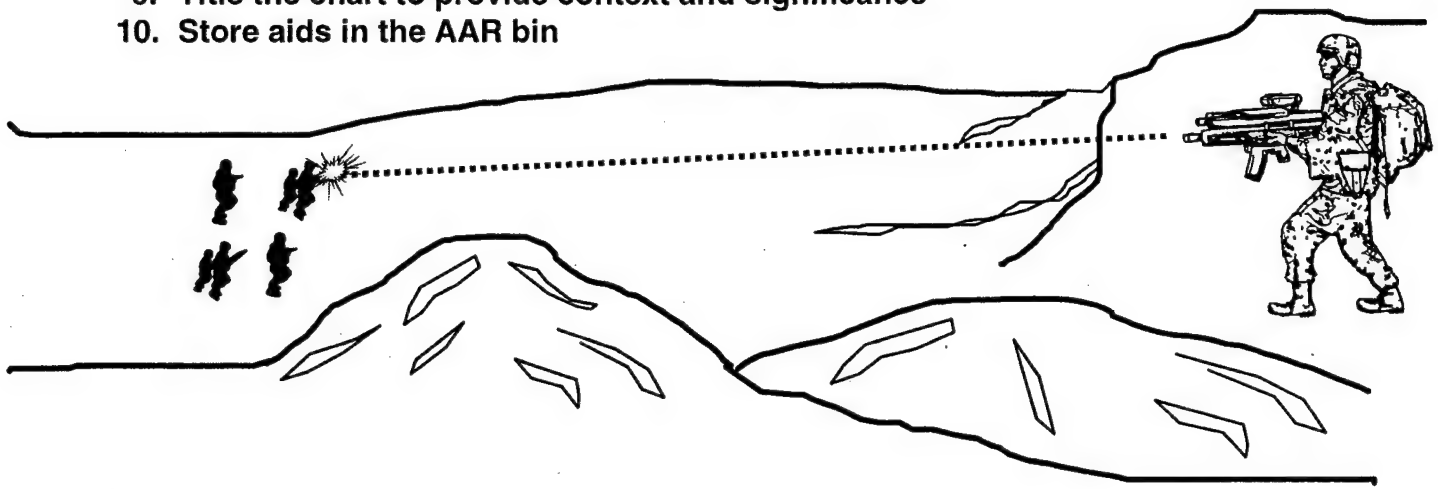
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Objective Individual Combat Weapon (LOS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

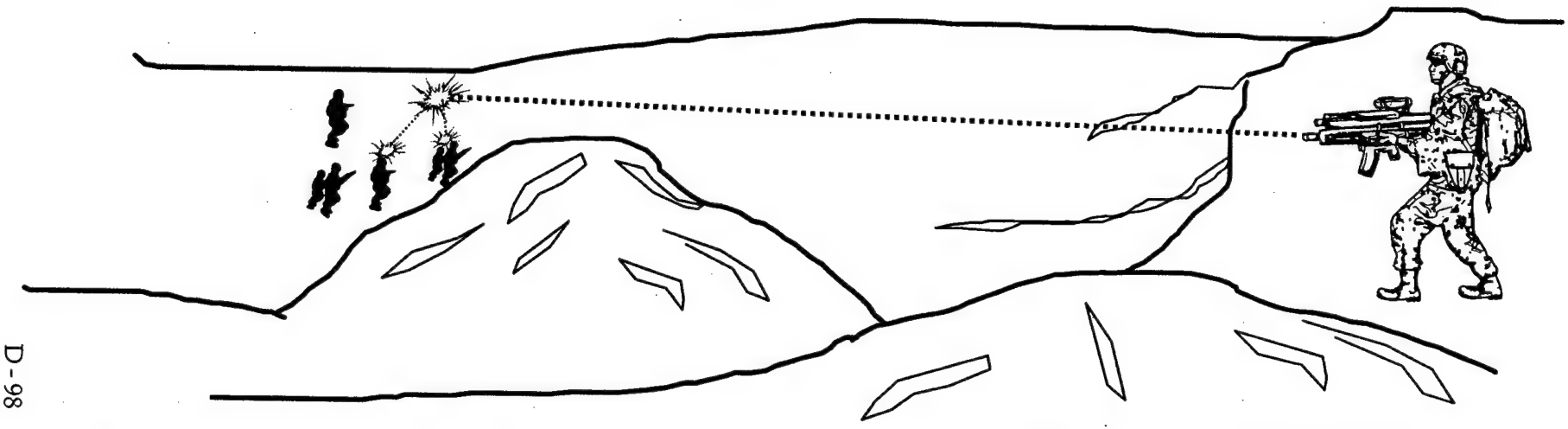
1. **Record engagement information from OC**
2. **Locate required weapon engagement in exercise history**
3. **Pan the map to the engagement area**
4. **Scale/zoom the map to display the engagement**
5. **Identify and display appropriate BLUFOR control measures**
6. **Prepare a top down view AAR aid of engagement**
7. **Title the AAR aid to provide context and significance**
8. **Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives**
9. **Title the chart to provide context and significance**
10. **Store aids in the AAR bin**



OC

1. **Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, type wounds for WIA, and KIA)**
2. **Record and report shooter ID and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations, and Close-in engagements)**

Intrinsic Feedback: Objective Individual Combat Weapon (NLOS)



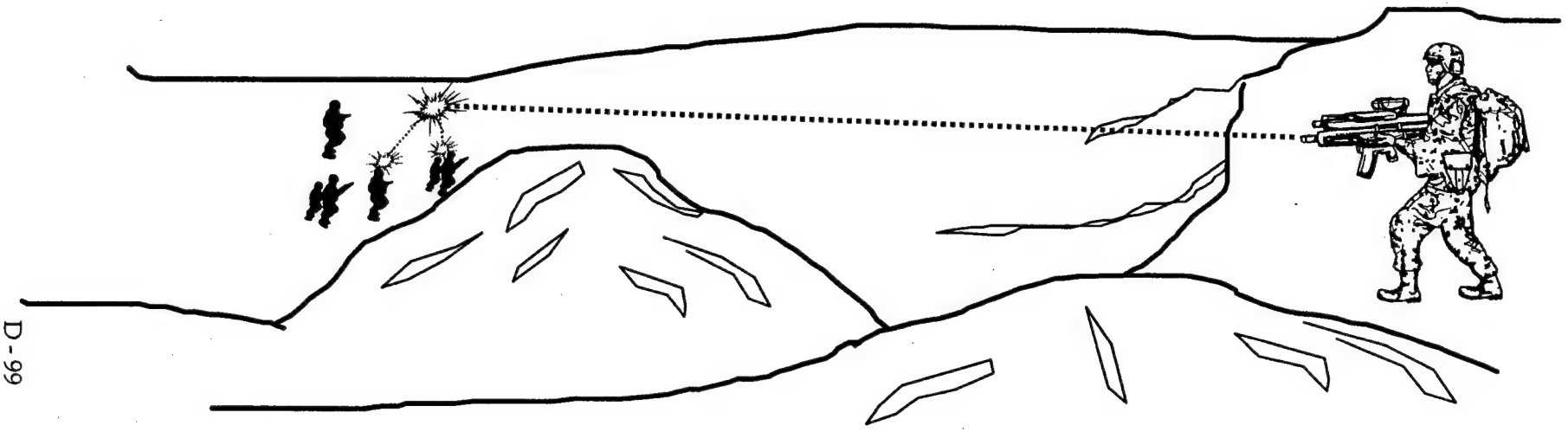
N - Audible indication of impacting ordnance (direct hits only)
N - Audible indication of Near Miss
Visual/audible indication of ordnance effects:
- N - Combat effective
- N - Out of action
- N - WIA (type wounds)
- N - KIA

N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
T - Visual/audible signature when weapon fires

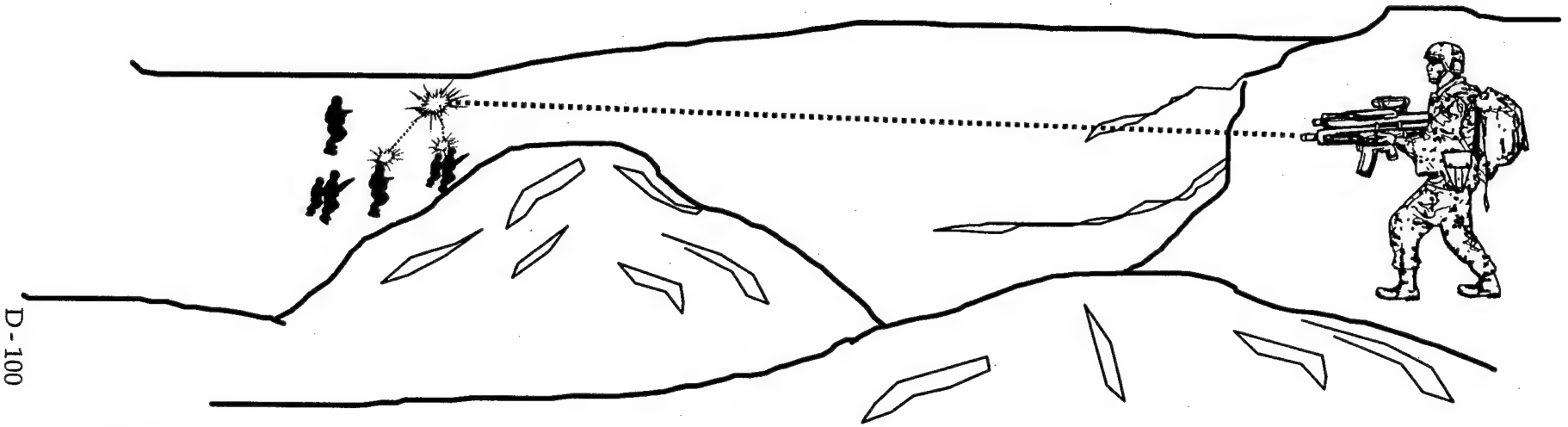
N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Objective Individual Combat Weapon (NLOS)



No OC or TAF analyst control functions needed. Current TES/IS cannot simulate Objective Individual Combat Weapon when using NLOS capability.

Extrinsic Feedback: Objective Individual Combat Weapon (NLOS)



N - Victim ID
N - Victim location
Victim status:
- N - Combat effective
- N - Out of action
- N - WIA (Type wounds)
- N - KIA

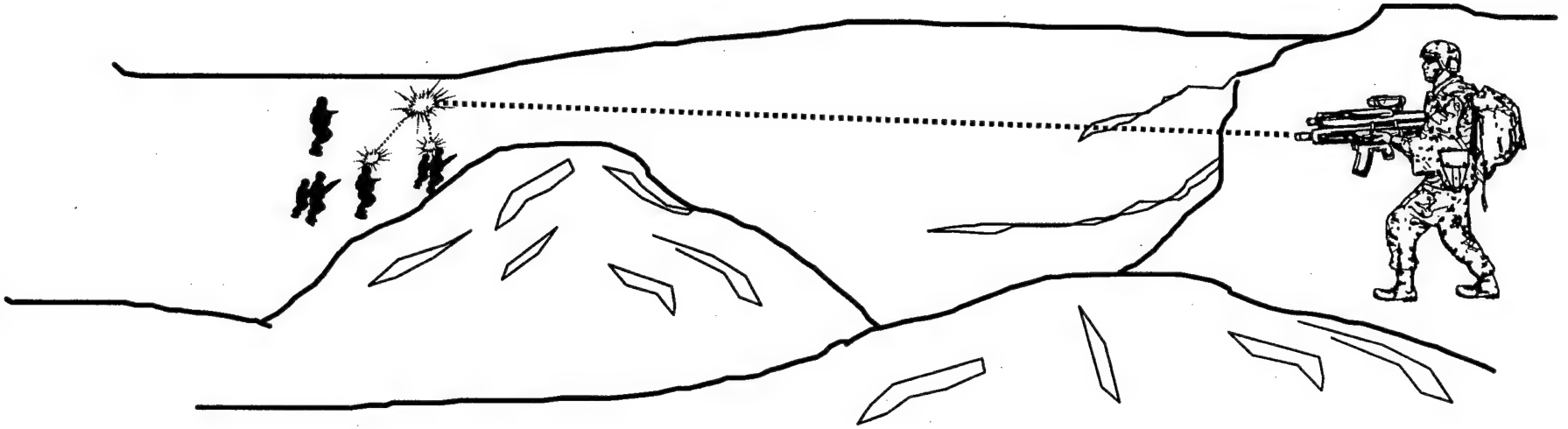
N - Kill code

N - Shooter ID
N - Shooter location
N - Weapon ranging capability
N - Pairing of shooter to victim for MILES engagements
N - Pairing of shooter to MISSES
N - Ammunition type and amount on hand
N - Ammunition type and amount fired

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

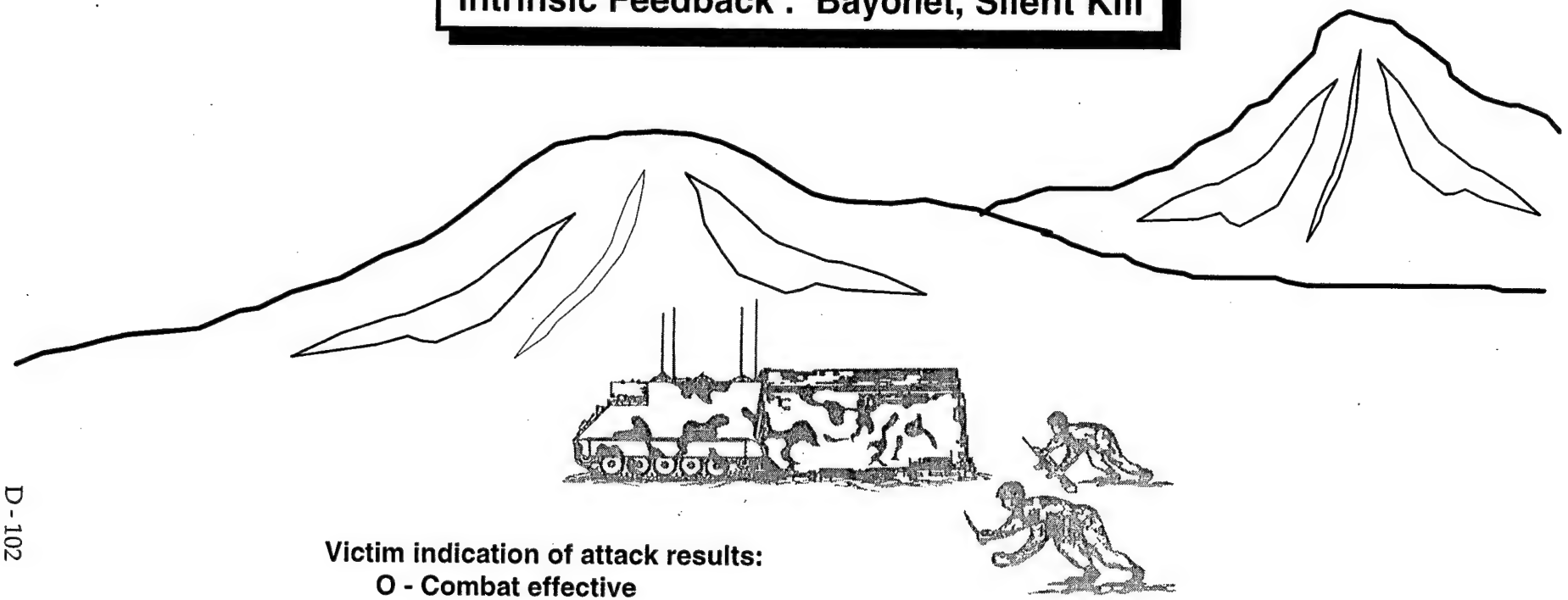
Extrinsic Feedback Functions: Objective Individual Combat Weapon (NLOS)

OC and TAF analysts intrinsic/control tasks which supported the collection of extrinsic data are not repeated. Unique tasks required to provide extrinsic feedback are listed below:



No OC or TAF analyst data collections functions tasks needed. Current TES/IS cannot simulate Objective Individual Combat Weapon when using NLOS capability.

Intrinsic Feedback : Bayonet, Silent Kill



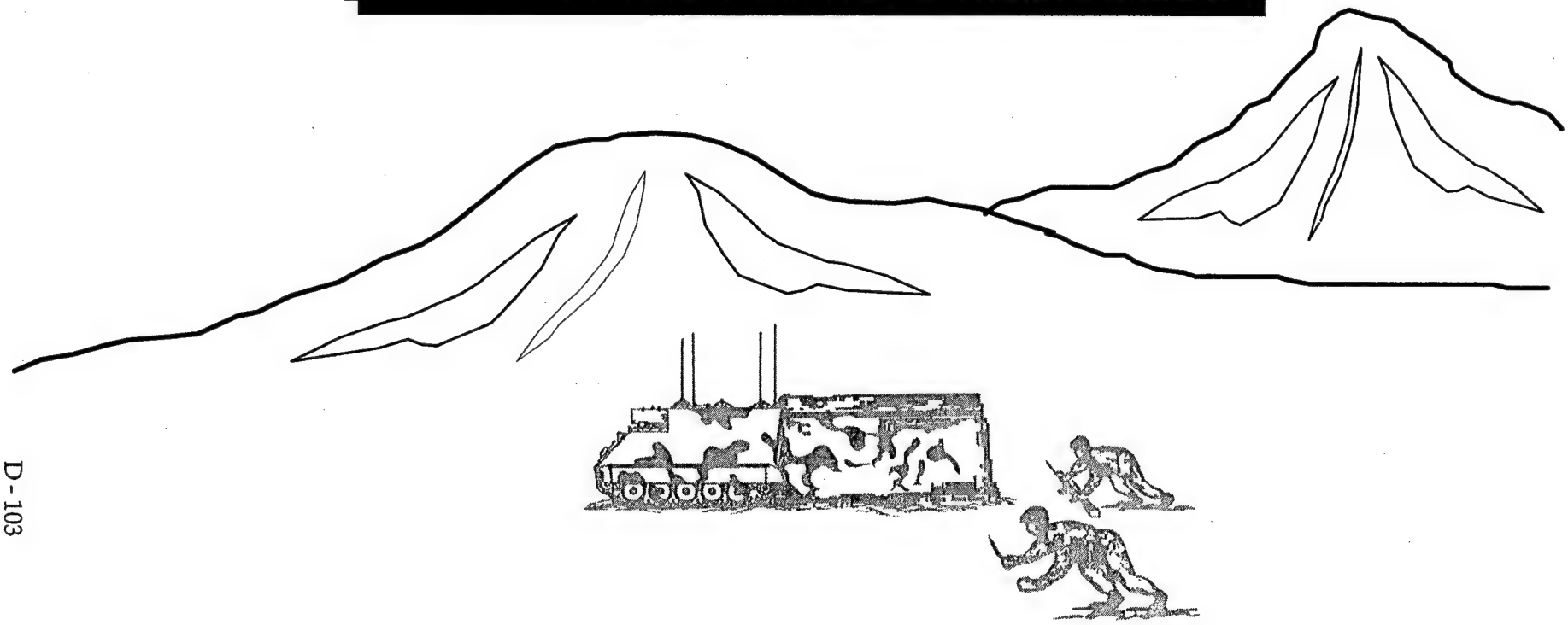
Victim indication of attack results:
- O - Combat effective
- O - KIA

P - Visual means to ID friendly and enemy
P - Maneuvers to attack position
P - Selects weapon for kill
Attack results:
- O - Combat effective
- O - KIA

N - Execution of actual attack

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

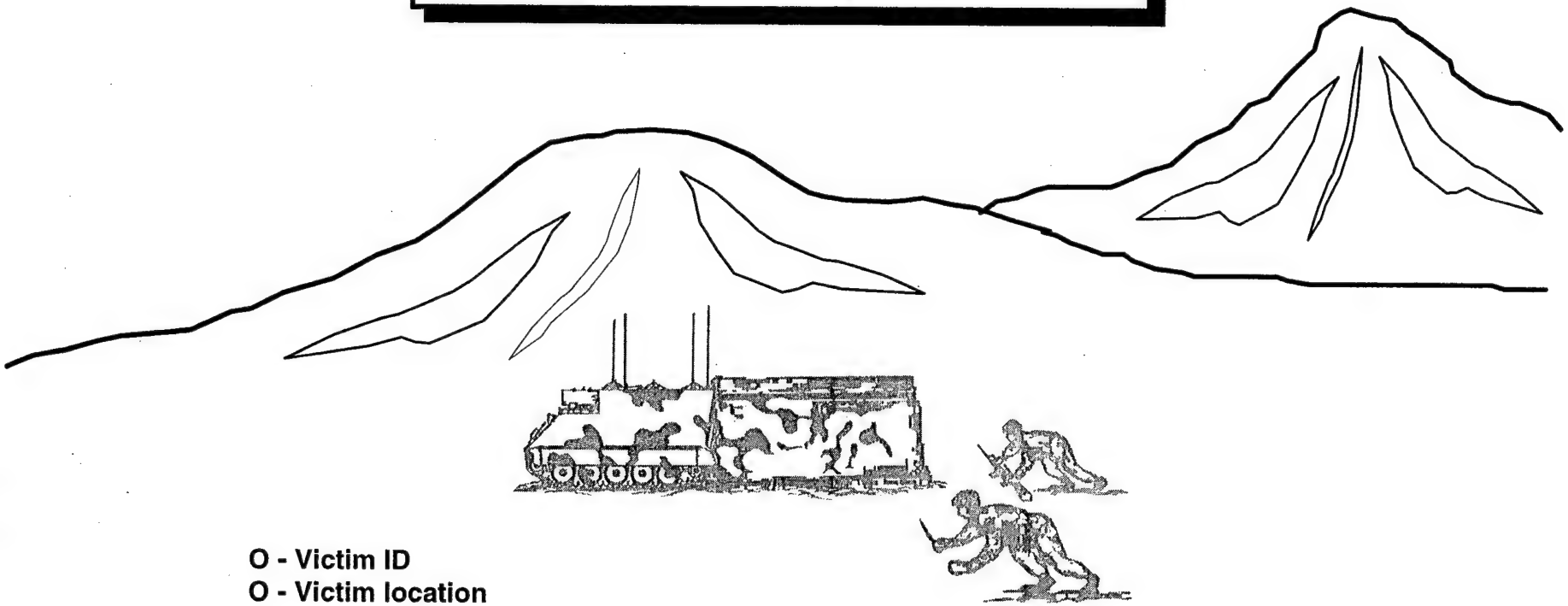
Intrinsic Feedback Functions: Bayonet, Silent Kill



OC

1. Coordinate with attacking soldier to determine victim identification
2. Verify soldier has proper weapon available for silent kill
3. Assess ability for silent attack based on soldier and victim location
4. Observe attack procedures to within 5 meters of victim, if attack valid, notify victim they are KIA, key their MILES harness, and replace their casualty card with a KIA card
5. If attacking soldier is compromised in the engagement, assess casualties as appropriate

Extrinsic Feedback: Bayonet, Silent Kill



O - Victim ID
O - Victim location
Victim status:
  O - Combat effective
  O - KIA

O - Attacker ID
O - Attacker location
O - Attacker weapon used
Attacker status:
  O - Combat effective
  O - KIA

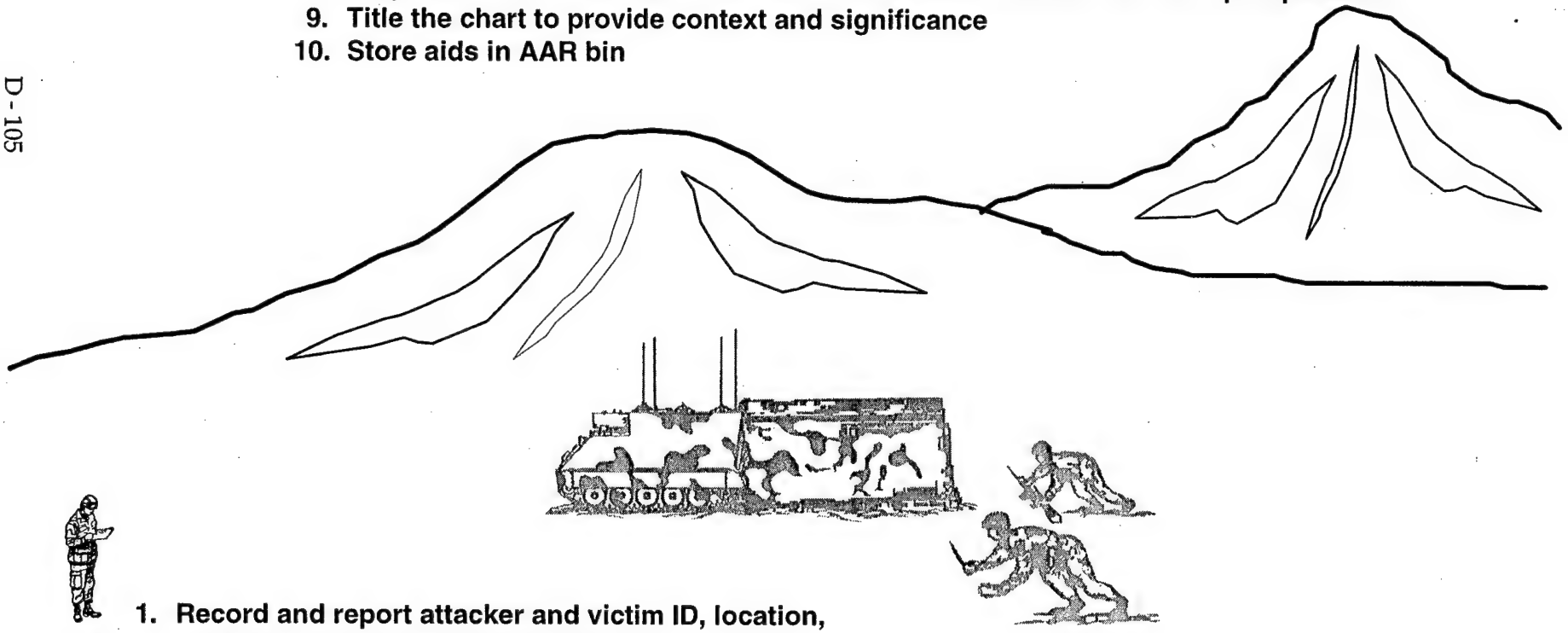
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Bayonet, Silent Kill

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record engagement information received from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical attacker victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin



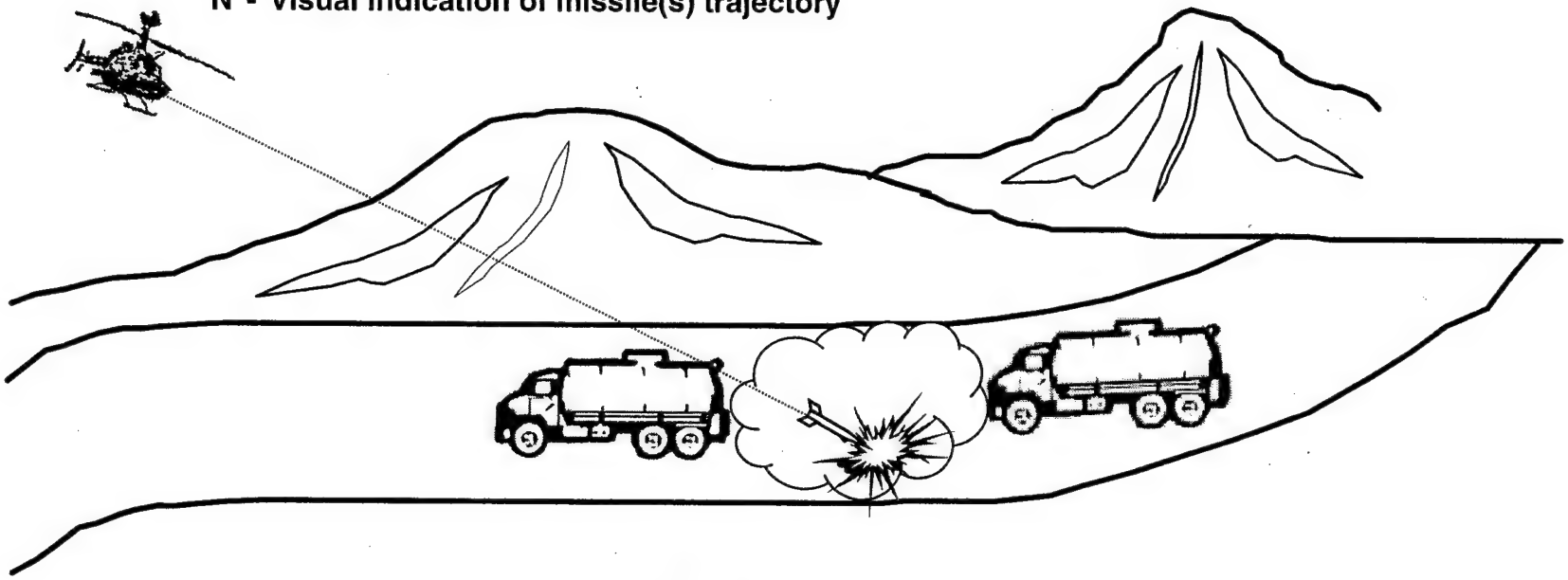
OC

1. Record and report attacker and victim ID, location, and status (Combat effective, KIA)

Intrinsic Feedback: Combustion Engine Defeat Mechanism

P - Visual means to ID friendly and enemy
T - Visual signature when weapon fires
Visual indication of ordnance effects:
- O - Fully operational
- O - Mobility kill

N - Visual indication of missile(s) trajectory



T - Visual signature of weapon shooting
Visual/audible indication of ordnance effects:
- O - Fully operational
- O - Mobility kill
- O - Type combat damage

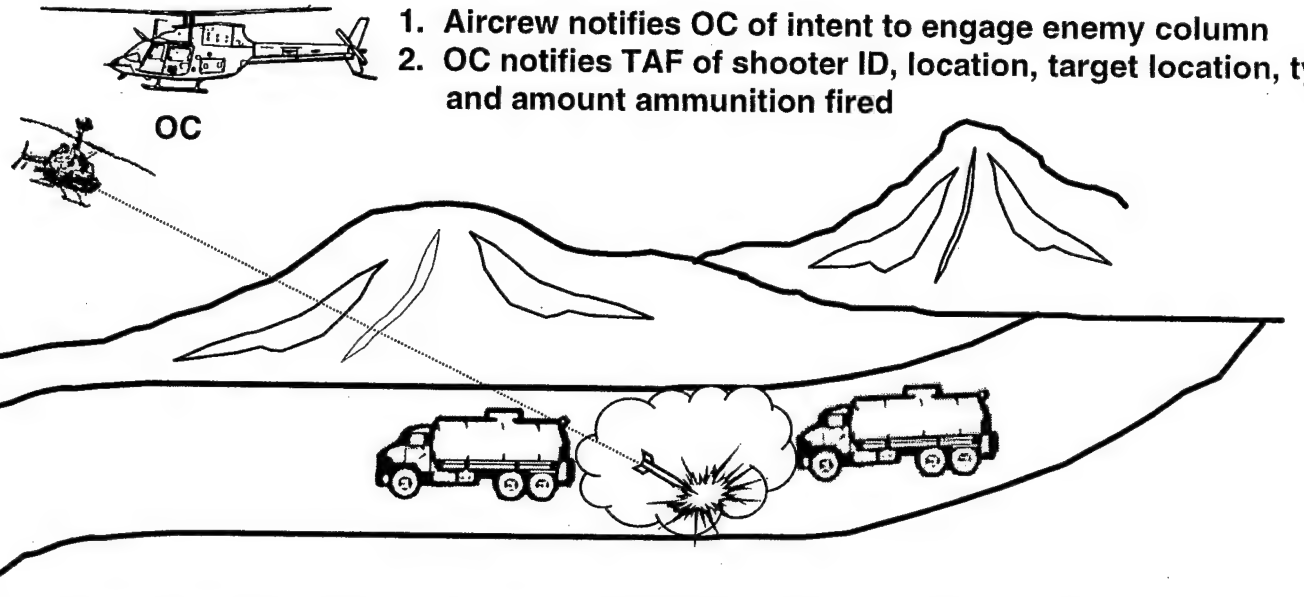
O-Visual indication of impacting ordnance

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Combustion Engine Defeat Mechanism

TAF Analyst

1. Receive engagement information from OC and enter into TAF workstation
2. Locate nearest fire marker to mark mission with smoke to depict engagement
3. Coordinate with fire marker on vehicle ID's and location of victims affected by smoke
4. Administratively assess affected vehicle(s) with mobility kills from TAF
5. If affected vehicle(s) ID not visible on TAF workstation, inform fire marker to assess vehicle as mobility kill



OC

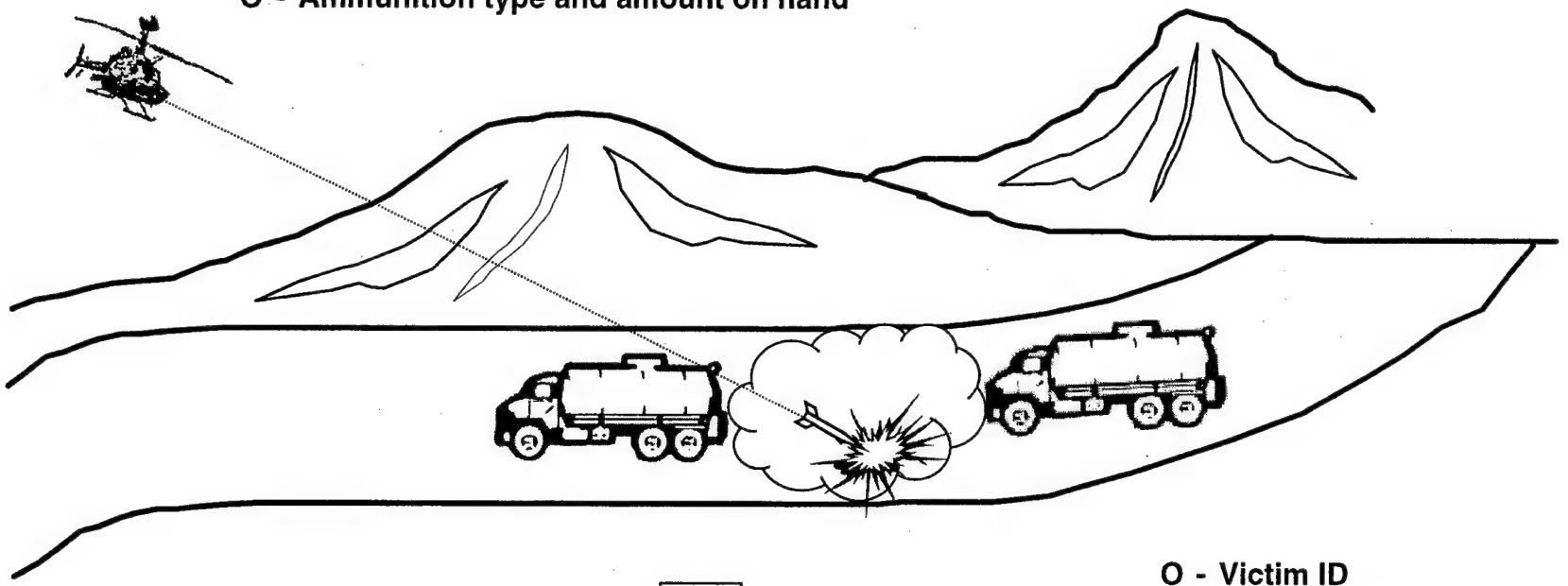
1. Aircrew notifies OC of intent to engage enemy column
2. OC notifies TAF of shooter ID, location, target location, type and amount ammunition fired

Firemarker

1. Receive location, volume, and type ordnance to mark from TAF analyst
2. Navigate to location of impacting ordnance
3. Mark fires with smoke as directed by the TAF
4. Notify TAF analyst when fires marked
5. Record and report victim ID and location of vehicles that are affected by smoke
6. Assess vehicle(s) with control gun as directed by TAF analyst

Extrinsic Feedback: Combustion Engine Defeat Mechanism

O - Shooter ID
O - Shooter location
O - Weapon ranging capability
O - Pairing of shooter to victim
O - Ammunition type and amount fired
O - Ammunition type and amount on hand



O - Victim ID
O - Victim location
Victim status:
- O - Fully operational
- O - Mobility kill
- O - Type combat damage

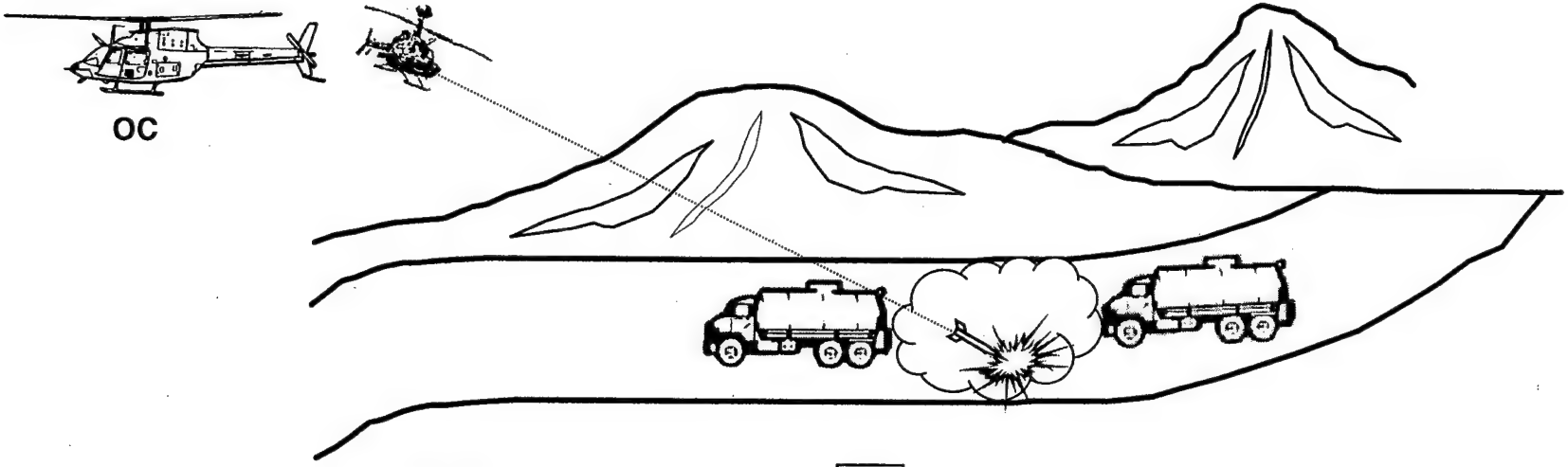
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Combustion Engine Defeat Mechanism

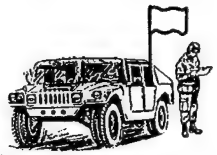
OC and TAF analysts intrinsic control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. **Record engagement information received from OC and firemarker**
2. **Locate required weapon engagement in exercise history**
3. **Pan the map to the engagement area**
4. **Scale/zoom the map to display the engagement**
5. **Identify and display appropriate BLUFOR control measures**
6. **Prepare a top down view AAR aid of the engagement**
7. **Title the AAR aid to provide context and significance**
8. **Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives**
9. **Title the chart to provide context and significance**
10. **Store aids in AAR bin**



OC

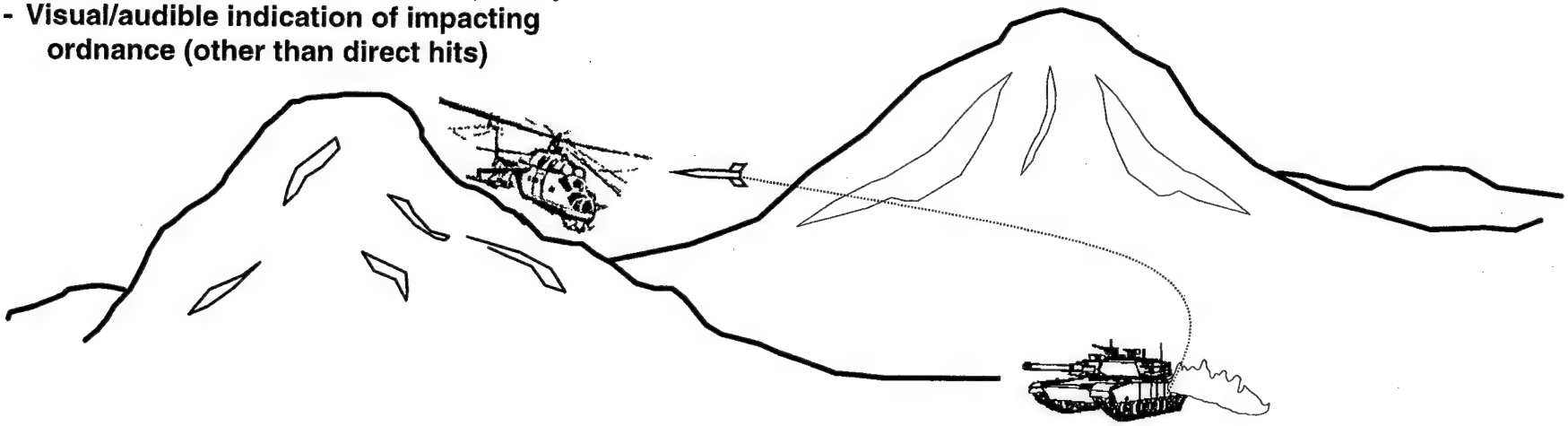


Firemarker

Intrinsic Feedback: Compact Kinetic Energy Missile

N - Out of action for MILES engagements
Visual/audible indication of ordnance effects:
- N- Fully operational
- N- Catastrophic kill
- N- Precautionary landing
- N- Emergency landing

N - Visual signature of weapon shooting
N - Visual indication of missile(s) trajectory
N - Visual/audible indication of impacting ordnance (other than direct hits)

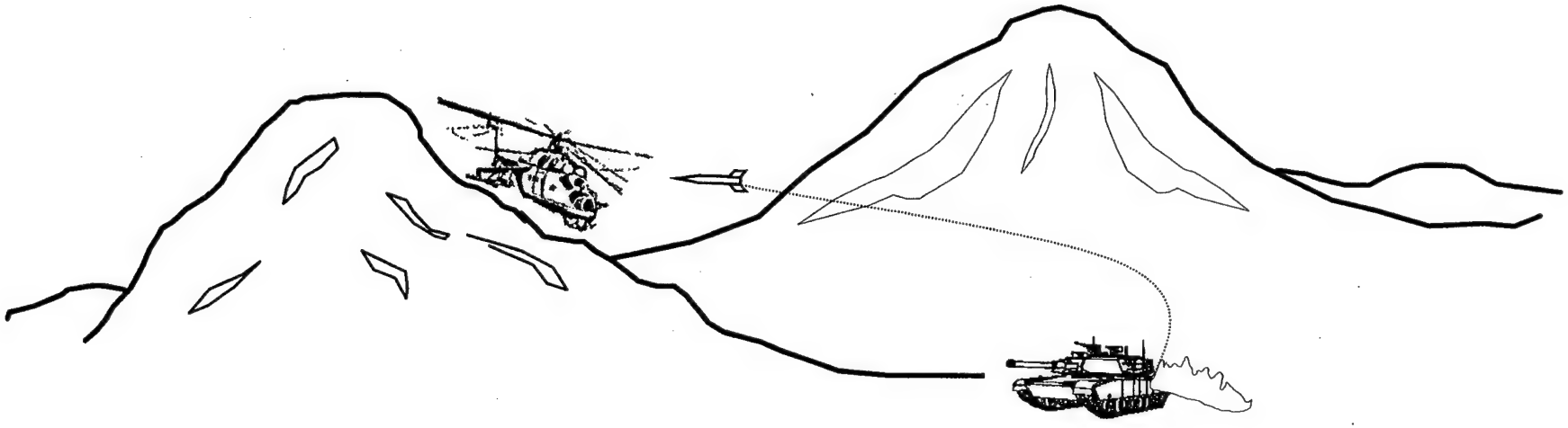


P - Visual means to ID friendly and enemy
N - Location of impacting ordnance (direct hits only)
Visual indication of ordnance effects:
- N - Combat effective
- N - Out of action

N - Visual/audible signature when weapon fires
N - Location of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Functions: Compact Kinetic Energy Missile

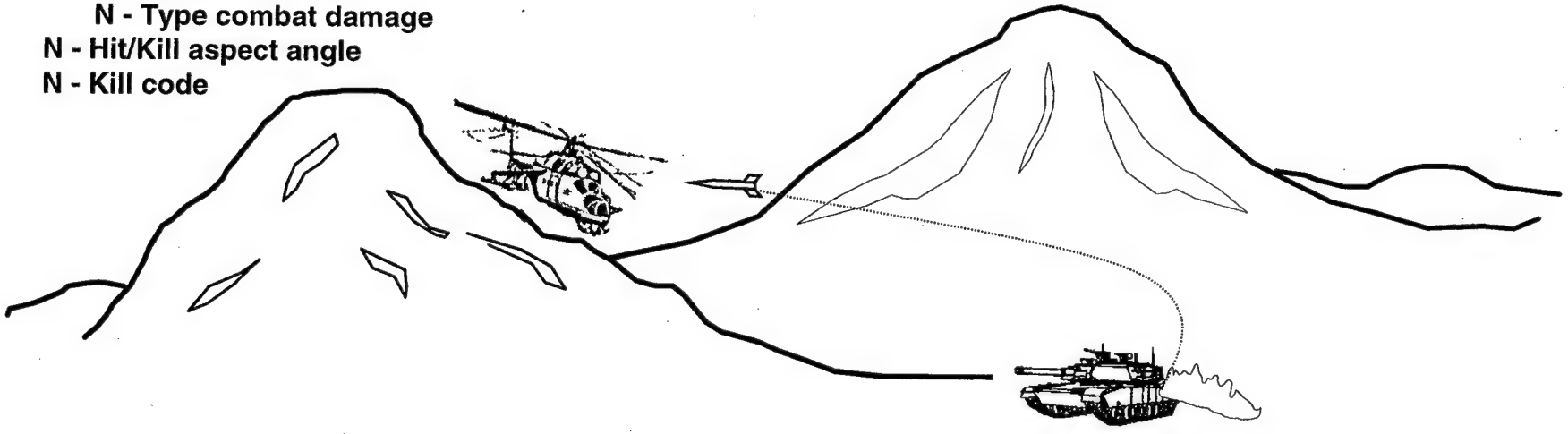


No OC or TAF analyst control functions needed. Current TES/IS cannot simulate Compact Kinetic Energy Missile capability.

Extrinsic Feedback: Compact Kinetic Energy Missile

N - Victim ID
N - Victim location
Victim status:
- N - Fully operational
- N - Catastrophic kill
- N - Type combat damage

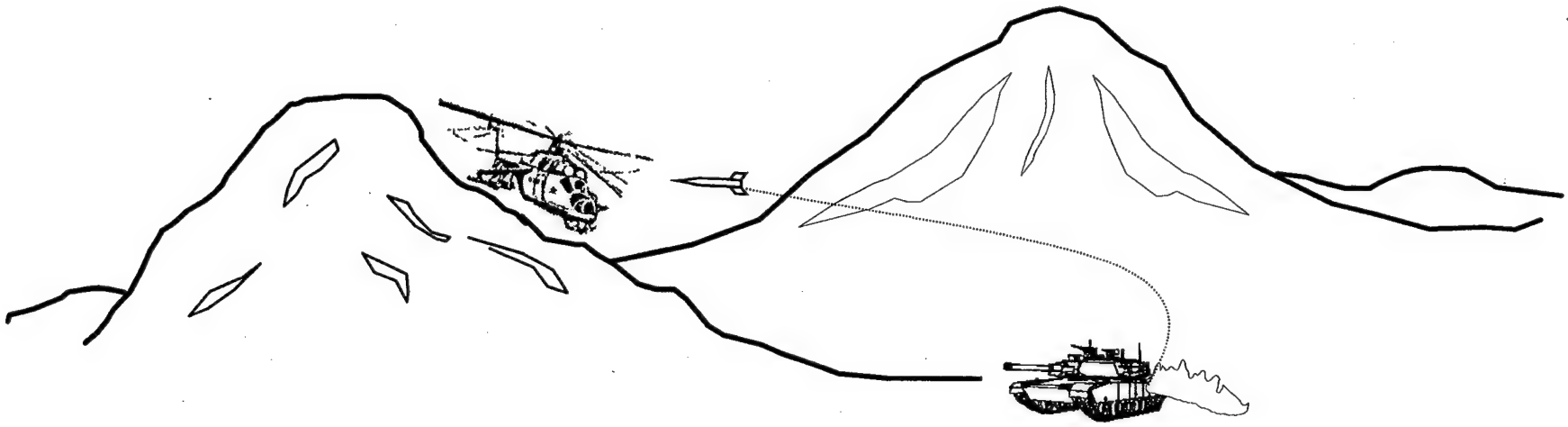
N - Hit/Kill aspect angle
N - Kill code



N - Shooter ID
N - Shooter location
N - Weapon ranging capability
N - Vector pairing of shooter to victim
N - Ammunition type and amount fired
N - Ammunition type and amount on hand
N - Pairing of shooter to misses
N - Location of shooter and victim when inter-visible and exposure time

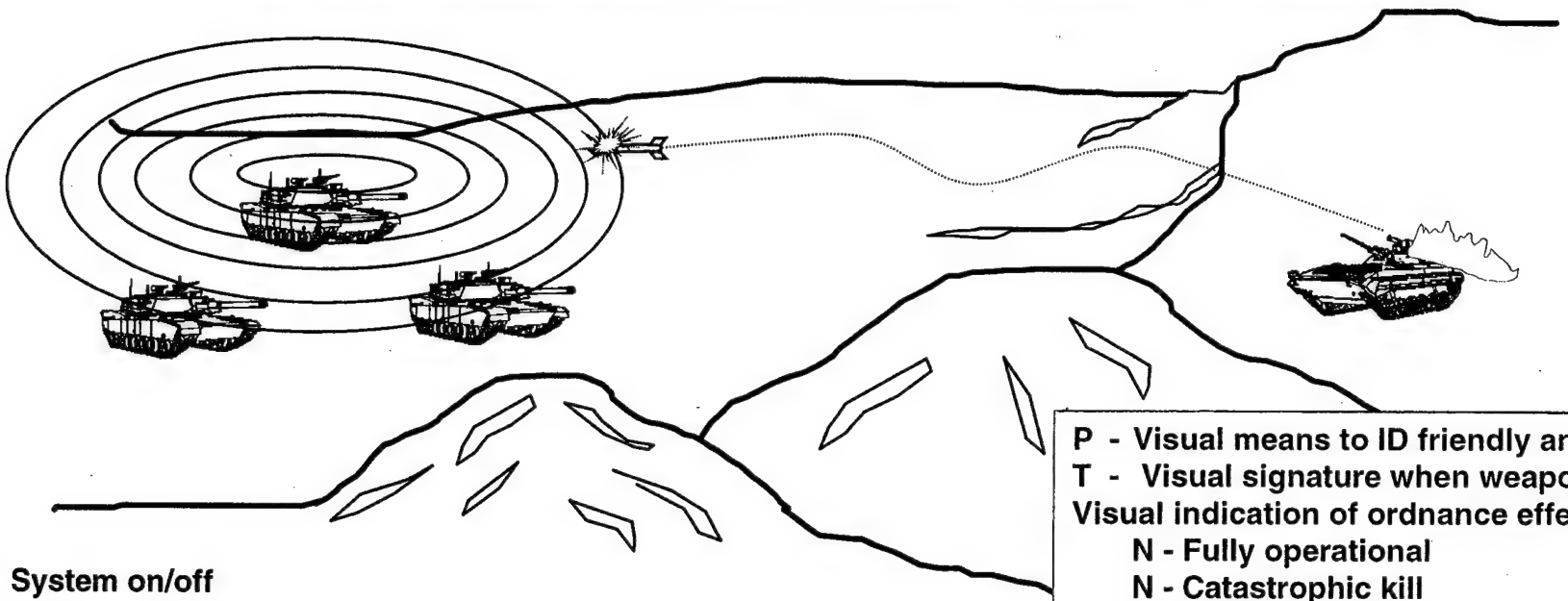
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Compact Kinetic Energy Missile



No OC or TAF analyst data collection functions needed. Current TES/IS cannot simulate Compact Kinetic Energy Missile capability.

Intrinsic Feedback: Ground Vehicle Distributed Defense



P - Visual means to ID friendly and enemy
T - Visual signature when weapon fires
Visual indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill

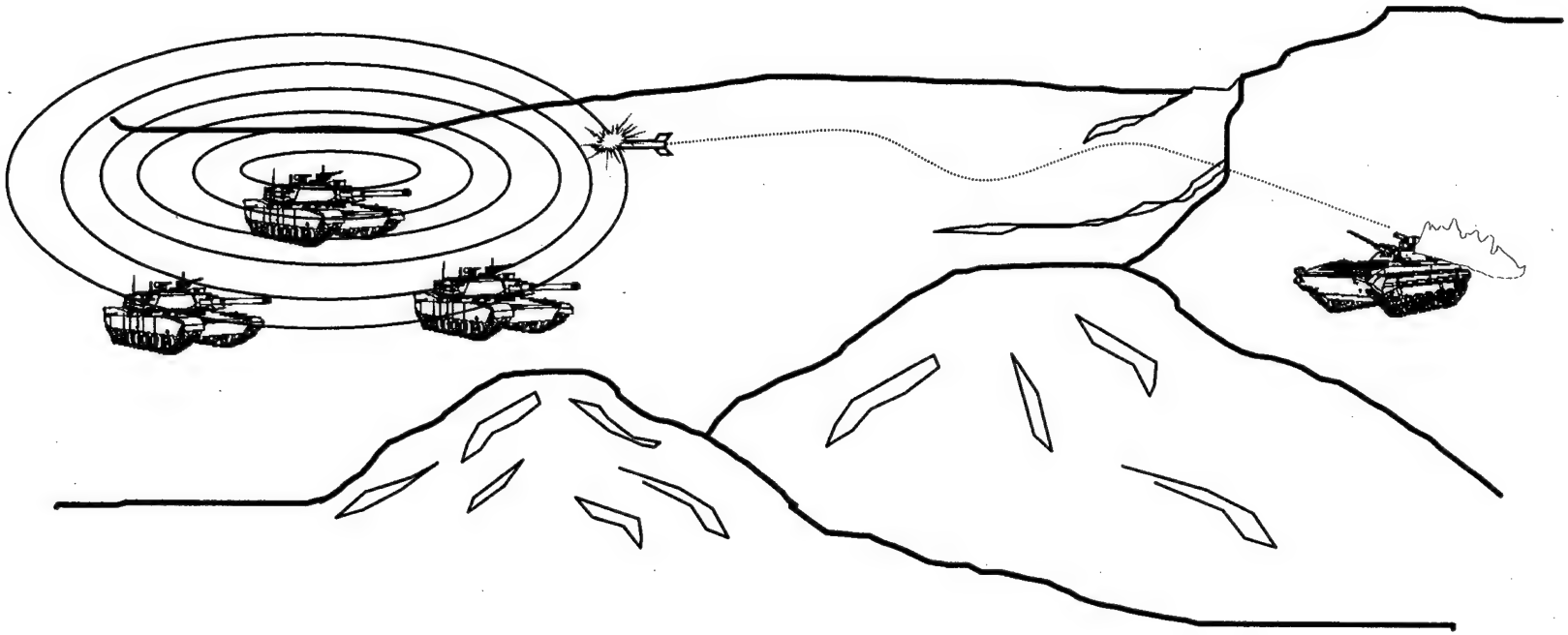
N - Location of impacting ordnance (other than direct hits)

P - System on/off
P - Vehicle ID with system activated
T - Visual signature of weapon shooting
N - Visual/audible indication of impacting ordnance (direct hits only)
N - Out of action for MILES engagements
Visual/audible indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill
- N - Firepower kill
- N - Mobility kill
- N - Communications kill
- N - Type combat damage

N - Visual/audible indication of impacting ordnance (other than direct hits)

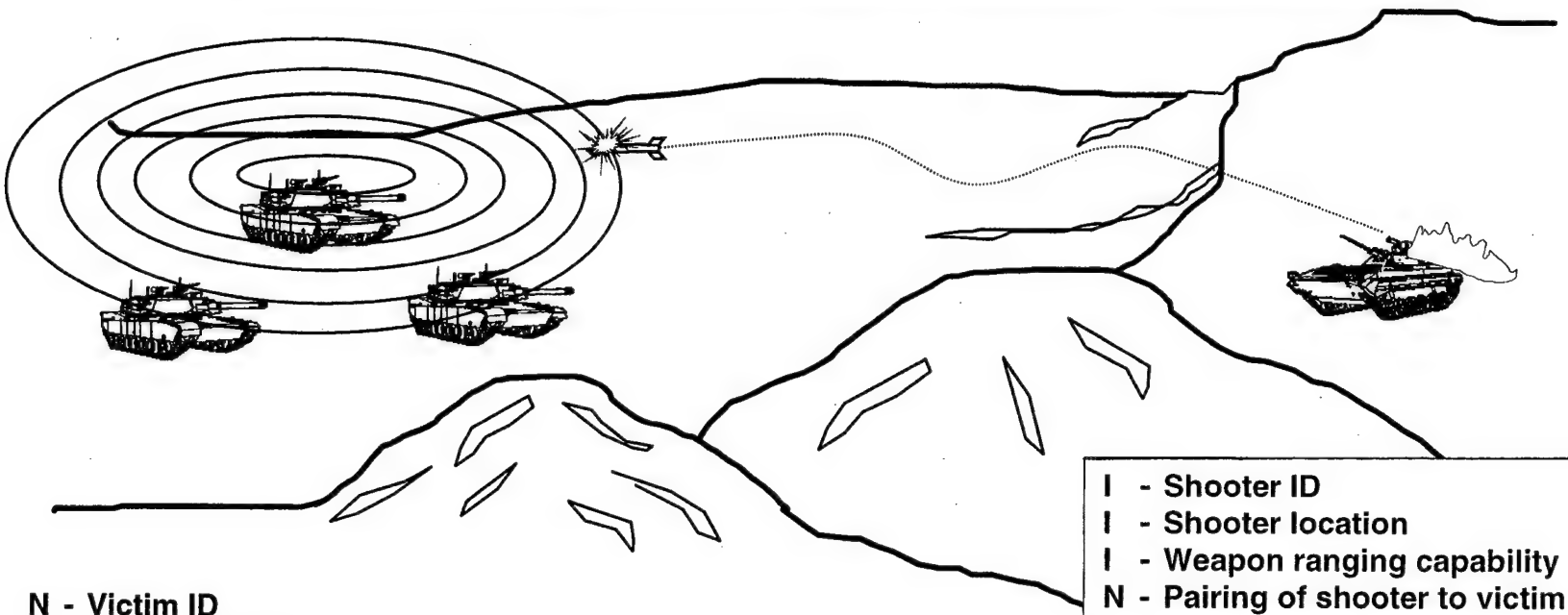
N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Ground Vehicle Distributed Defense



No OC or TAF analyst control tasks needed. Current TES/IS cannot simulate Ground Vehicle Distributed Defense capability

Extrinsic Feedback: Ground Vehicle Distributed Defense



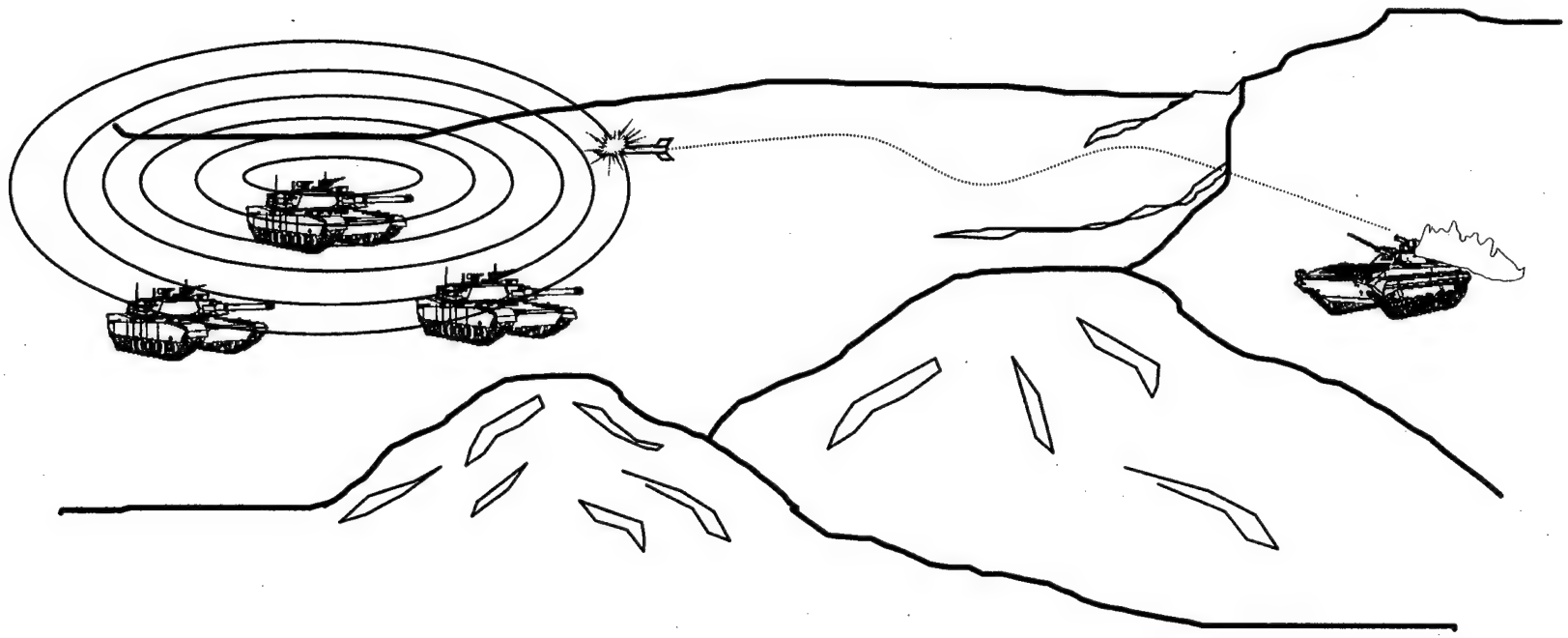
I - Shooter ID
I - Shooter location
I - Weapon ranging capability
N - Pairing of shooter to victim for MILES engagements
N - Pairing of shooter to MISSES
N - Ammunition type and amount fired
N - Ammunition type and amount on hand
N - Location of shooter and victim when inter-visible and exposure time

N - Victim ID
N - Victim location
Victim status:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill
- N - Communications kill
- N - Type combat damage

N - Vehicle ID with system activated
N - Radius of coverage
N - Hit/Kill aspect angle
N - Kill code

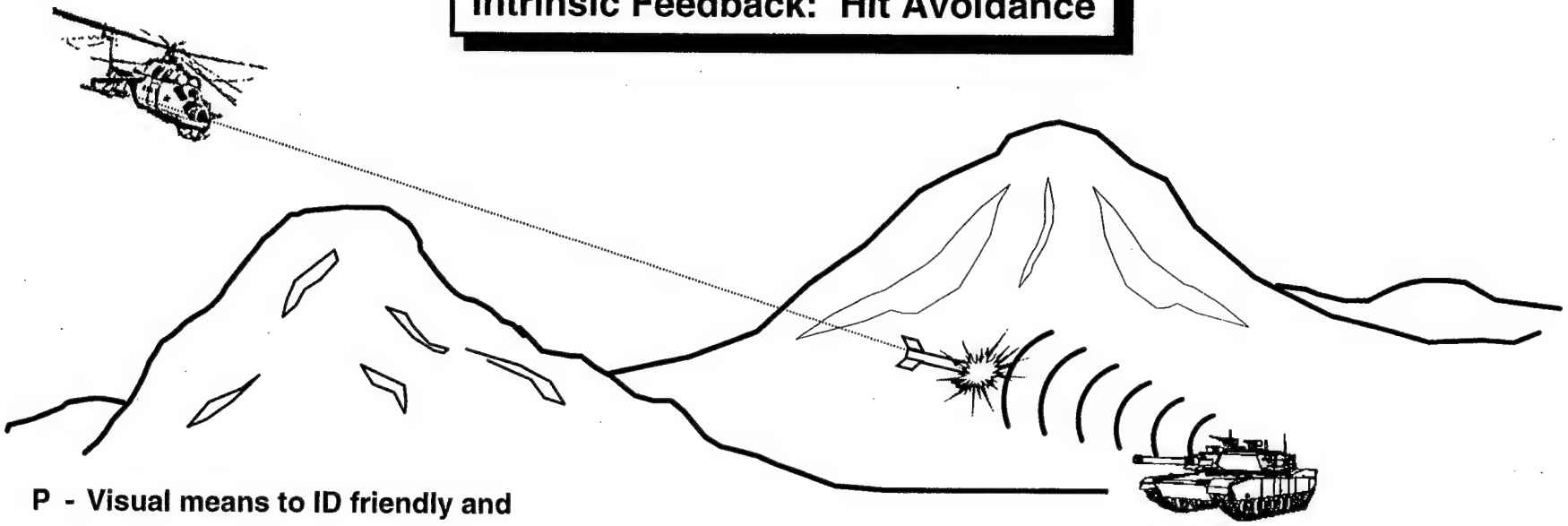
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Ground Vehicle Distributed Defense



No OC or TAF analyst data collection functions needed. Current TES/IS cannot simulate Ground Vehicle Distributed Defense capability

Intrinsic Feedback: Hit Avoidance



P - Visual means to ID friendly and enemy
T - Visual signature when weapon fires
Visual indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill

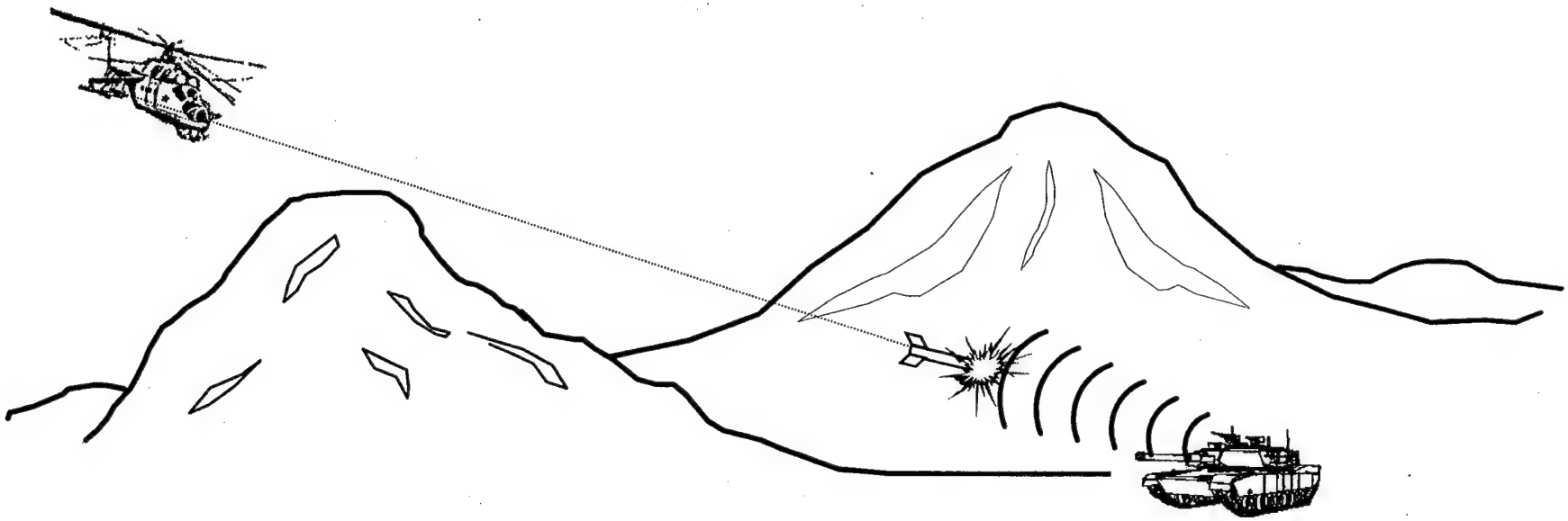
N - Location of impacting ordnance (other than direct hits)

P - Selection of Hit Avoidance countermeasures based on Commanders Decision Aid recommendation
T - Visual signature of weapon shooting
T - Visual/audible indication of Near Miss
N - Visual/audible indication of impacting ordnance (direct hits only)
N - Out of action for MILES engagements
Visual/audible indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill
- N - Firepower kill
- N - Mobility kill
- N - Communications kill
- N - Type combat damage

N - Visual/audible indication of impacting ordnance (other than direct hits)

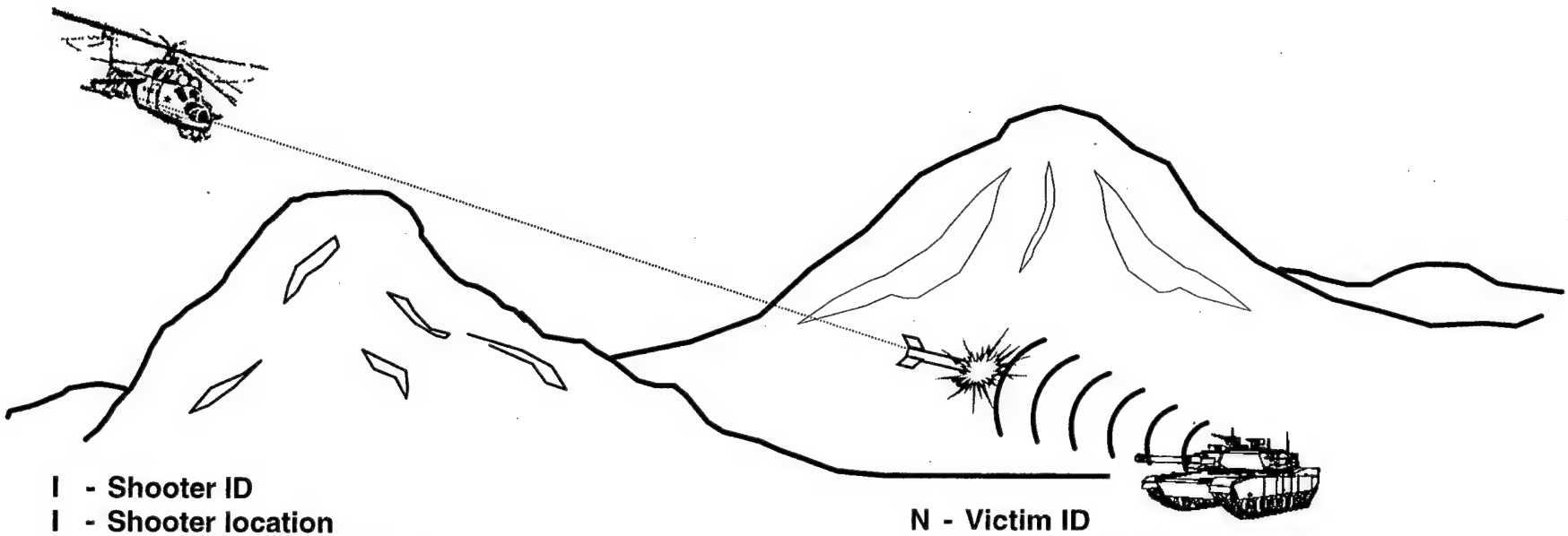
N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Hit Avoidance



No OC or TAF analyst control functions needed. Current TES/IS cannot simulate Hit Avoidance System

Extrinsic Feedback: Hit Avoidance



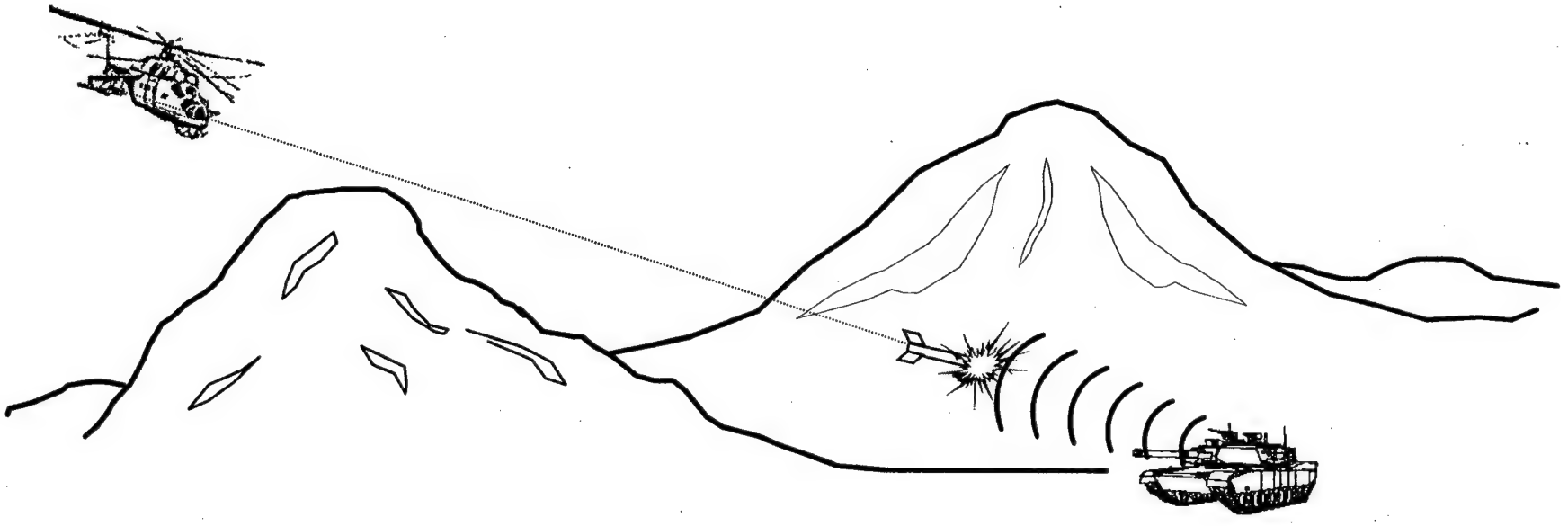
I - Shooter ID
I - Shooter location
I - Weapon ranging capability
N - Pairing of shooter to victim for MILES engagements
N - Pairing of shooter to MISSES
N - Ammunition type and amount fired
N - Ammunition type and amount on hand
N - Location of shooter and victim when inter-visible and exposure time

N - Victim ID
N - Victim location
Victim status:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill
- N - Communications kill
- N - Type combat damage

N - Countermeasure Threat level selected from Commanders Decision Aid
N - Hit/Kill aspect angle
N - Kill code

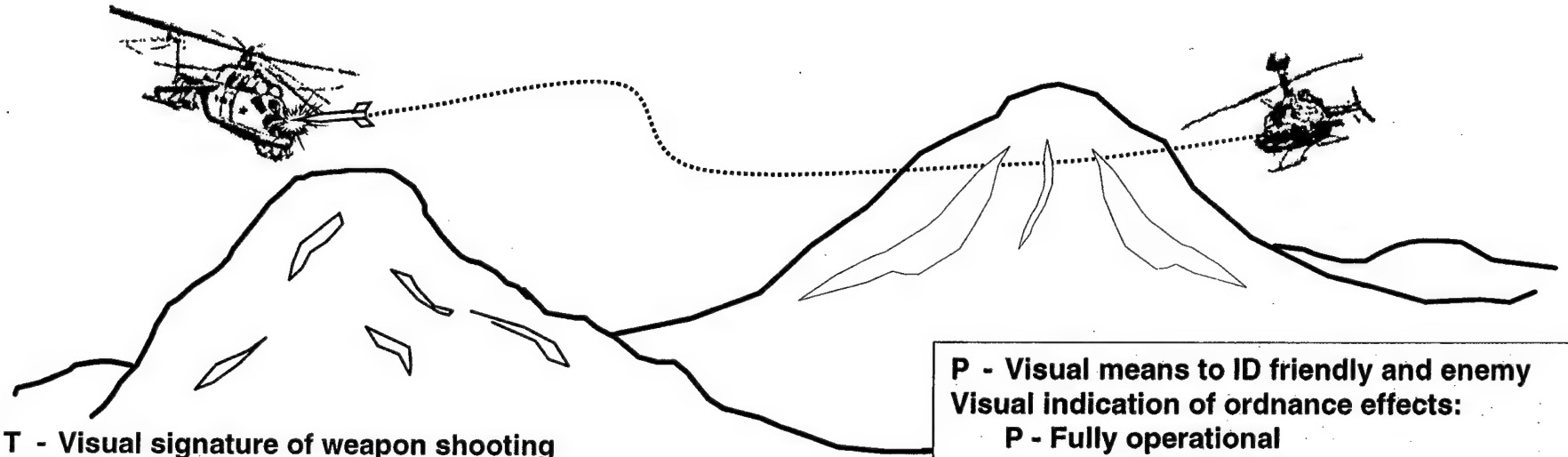
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Hit Avoidance



No OC or TAF analyst data collection functions needed. Current TES/IS cannot simulate Hit Avoidance System

Intrinsic Feedback: Rotorcraft Air Combat Enhancement (RACE)



T - Visual signature of weapon shooting
T - Visual/audible indication of impacting ordnance (direct hits only)
T - Out of action for MILES engagements
T - Aircraft survivability equipment on or off
O - Out of action for control gun assessments
Visual/audible indication of ordnance effects:
- T - Fully operational
- T - Catastrophic kill
- T - Firepower kill
- T - Mobility kill
- T - Communications kill
- P - Type combat damage

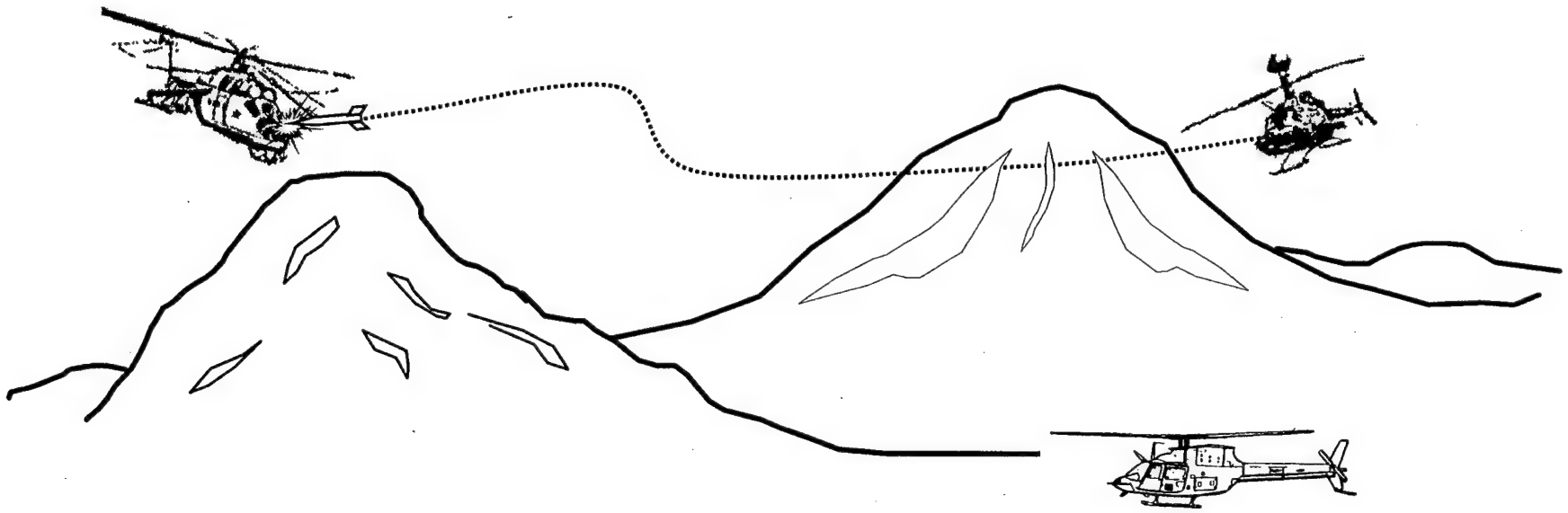
N - Visual/audible indication of Near Miss
N - Visual/audible indication of impacting ordnance (other than direct hits)

P - Visual means to ID friendly and enemy
Visual indication of ordnance effects:
- P - Fully operational
- P - Catastrophic kill

T - Visual signature when weapon fires
T - Location of impacting ordnance (direct hits only)
T - Aircraft survivability equipment on or off
N - Audible signature when weapon fires
N - Visual indication of missile(s) trajectory
N - Location of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

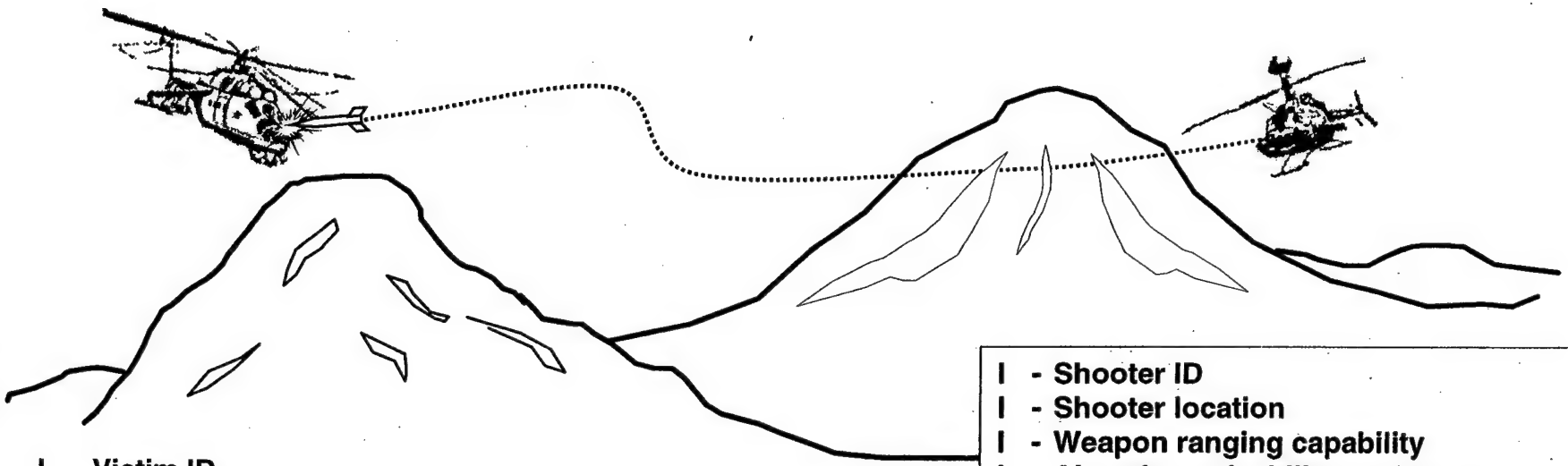
Intrinsic Feedback Functions: Rotorcraft Air Combat Enhancement (RACE)



OC

1. Manually adjudicate battle damage and casualties for MILES/AGES II limitations (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

Extrinsic Feedback: Rotorcraft Air Combat Enhancement (RACE)



I - Victim ID
I - Victim location
I - Aircraft survivability equipment on or off
Victim status:
- I - Fully operational
- I - Catastrophic kill
- I - Mobility kill
- I - Firepower kill
- I - Communications kill
- O - Type combat damage

O - Hit/Kill aspect angle
O - Kill code

I - Shooter ID
I - Shooter location
I - Weapon ranging capability
I - Aircraft survivability equipment on or off
O - Pairing of shooter to victim for control gun assessments
N - Pairing of shooter to victim for MILES engagements
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES
N - Location of shooter and victim when inter-visible and exposure time

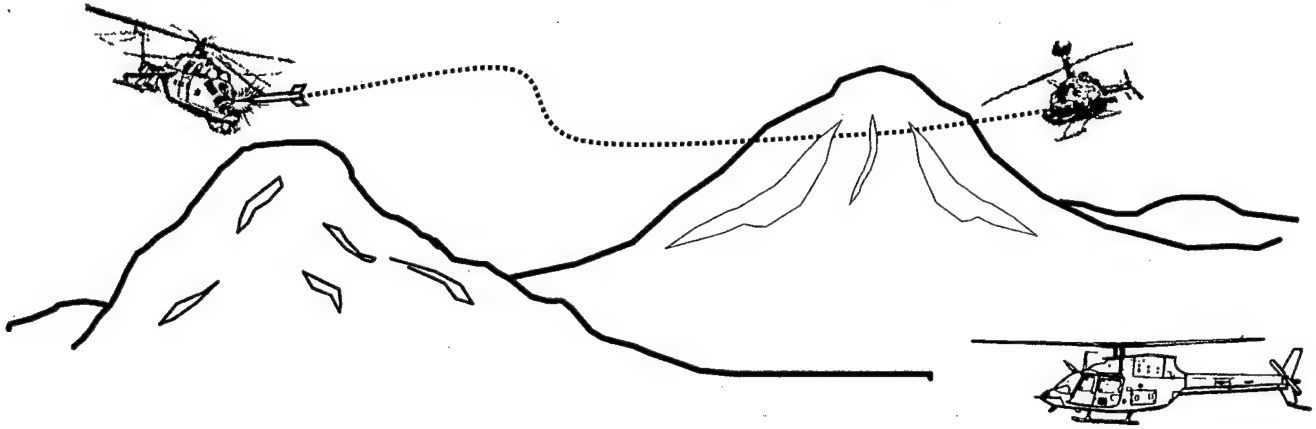
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Rotorcraft Air Combat Enhancement (RACE)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate



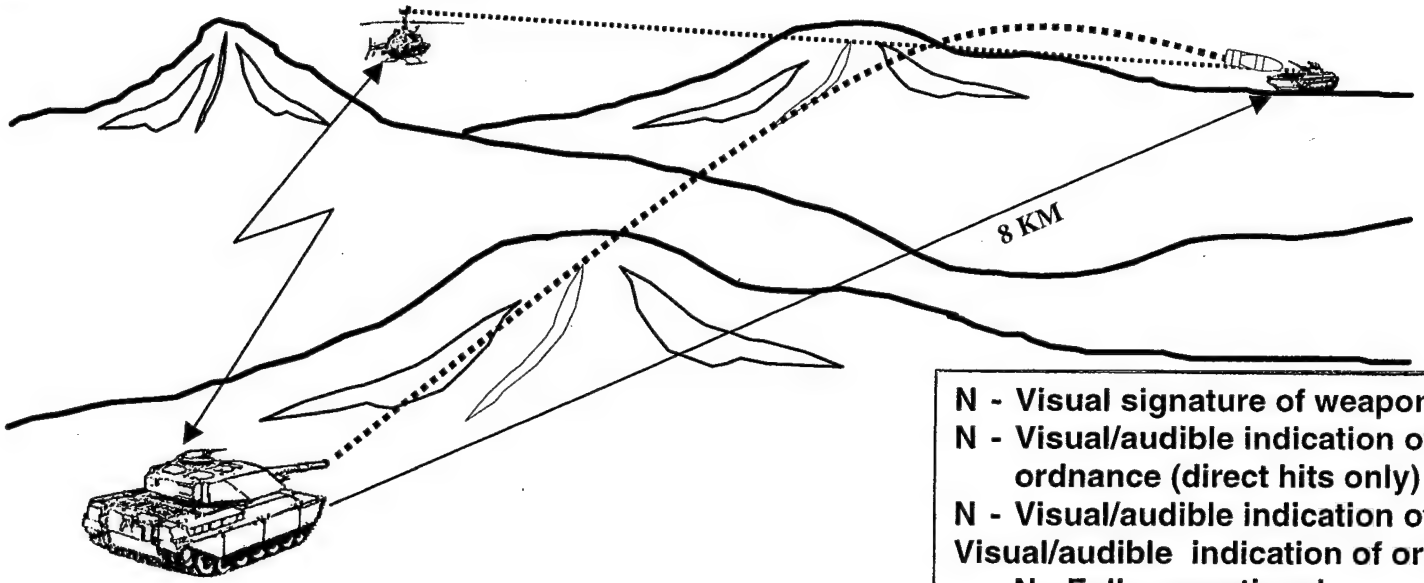
OC

1. Obtain and record "kill codes," Hit/Kill aspect angle, and type combat damage for BLUFOR victims
2. Obtain and record "kill codes" for OPFOR victims
3. Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

Intrinsic Feedback: Tank Extended Range Munition (TERM)

P - Detection and designation of target
P - Communications with shooter
Visual indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill

N - Location of impacting ordnance (direct hits only)
N - Location of impacting ordnance (other than direct hits)



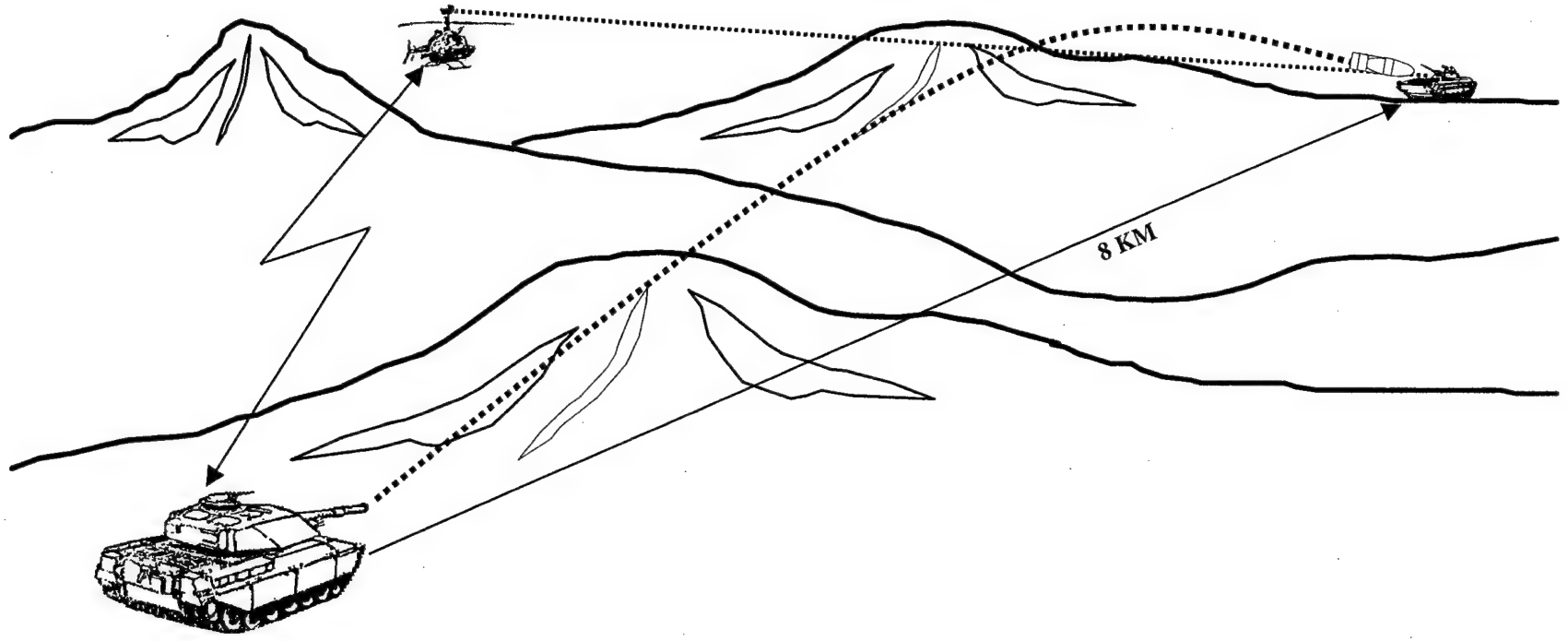
P - Communication with observer
T - Visual/audible signature when weapon fires

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

N - Visual signature of weapon shooting
N - Visual/audible indication of impacting ordnance (direct hits only)
N - Visual/audible indication of Near Miss
Visual/audible indication of ordnance effects:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill
- N - Communications kill
- N - Type combat damage

N - Visual/audible indication of impacting ordnance (other than direct hits)

Intrinsic Feedback Functions: Tank Extended Range Munition (TERM)



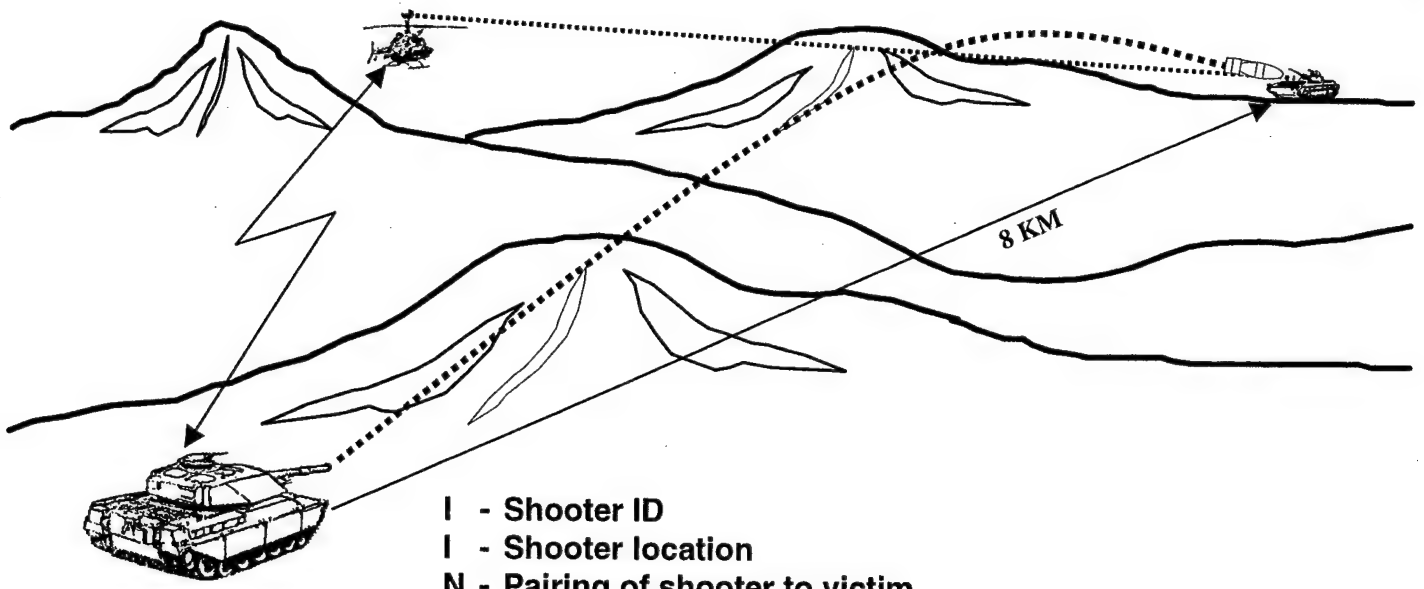
No OC or TAF analyst control functions needed. Current TES/IS cannot simulate Tank Extended Range Munition capability

Extrinsic Feedback: Tank Extended Range Munition (TERM)

N - Victim ID
N - Victim location
Victim status:
- N - Fully operational
- N - Catastrophic kill
- N - Mobility kill
- N - Firepower kill
- N - Communications kill
- N - Type combat damage

N - Hit/Kill aspect angle

O - Observer ID
O - Observer location
O - Target Location Data sent
N - Laser designation procedures



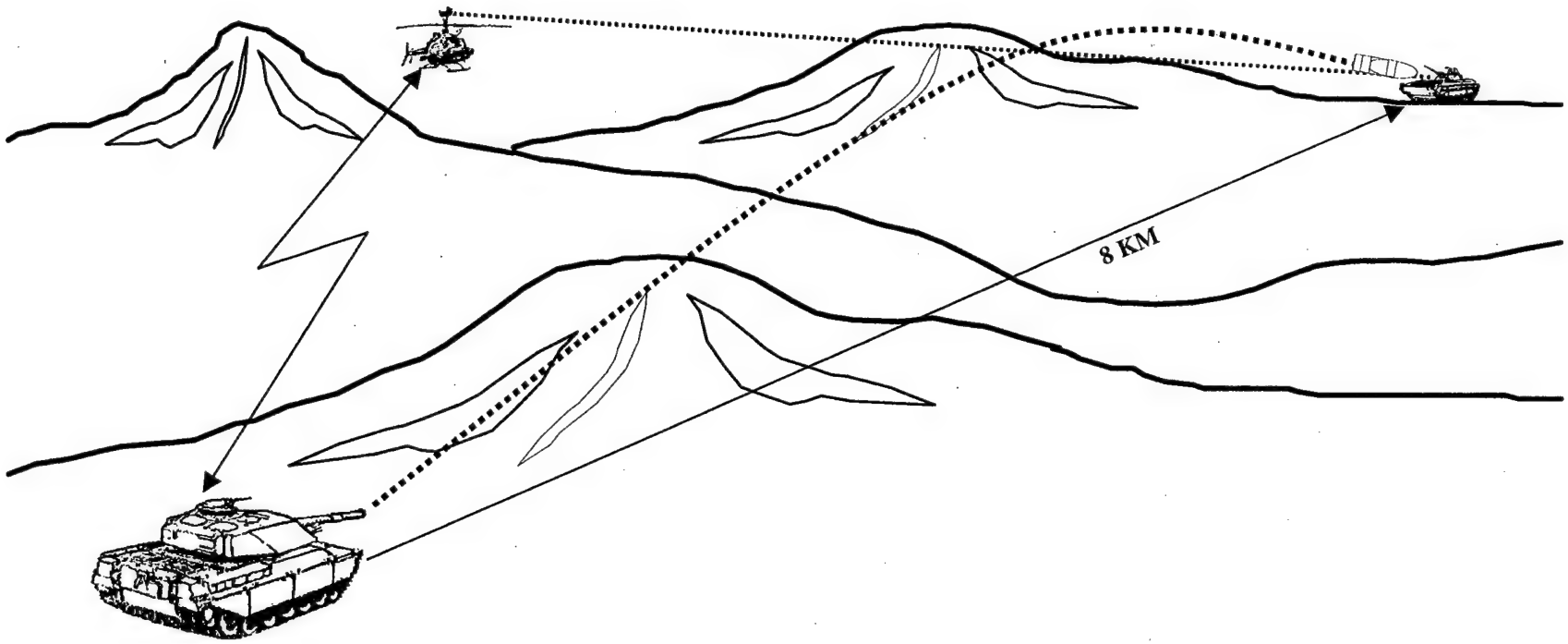
I - Shooter ID
I - Shooter location
N - Pairing of shooter to victim
N - Ammunition type and amount on hand
N - Ammunition type and amount fired
N - Pairing of shooter to MISSES

N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Tank Extended Range Munition (TERM)

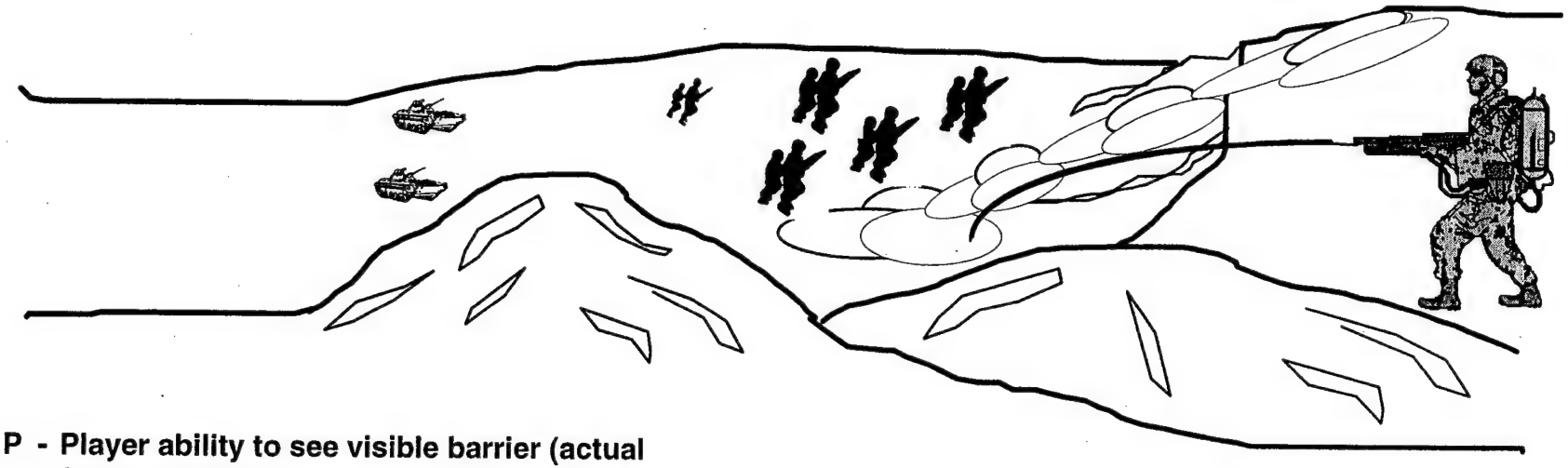
OC

1. Record and report Observer ID, Location, and target location sent to shooter



NOTE:
Although collection of this extrinsic data by the OC is feasible, the unattainable feedback listed on the previous page (N-coded items) precludes observation and assessment of the engagement

Intrinsic Feedback: Aqueous Foam Barrier

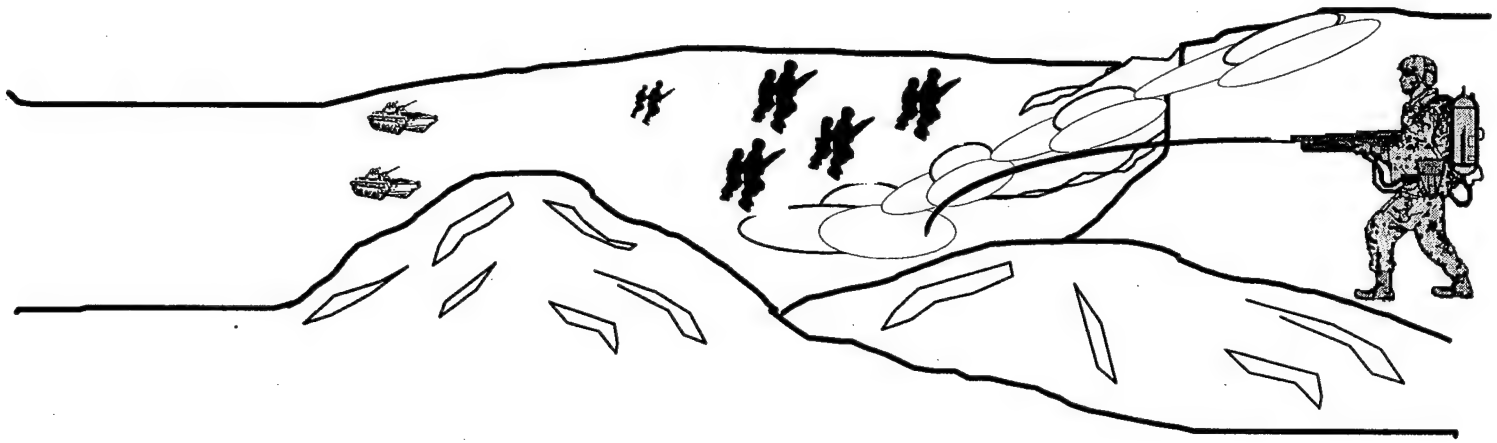


P - Player ability to see visible barrier (actual foam employed)
P - Visual indication of created lanes
Victim degree of degradation:
O - Irritant warning (near miss indication)
O - WIA (NON-LETHAL wounds)

P - Visual means to ID friendly and antagonist
P - Visual indication of emplaced barrier
O - Visual indication of effects on antagonist

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

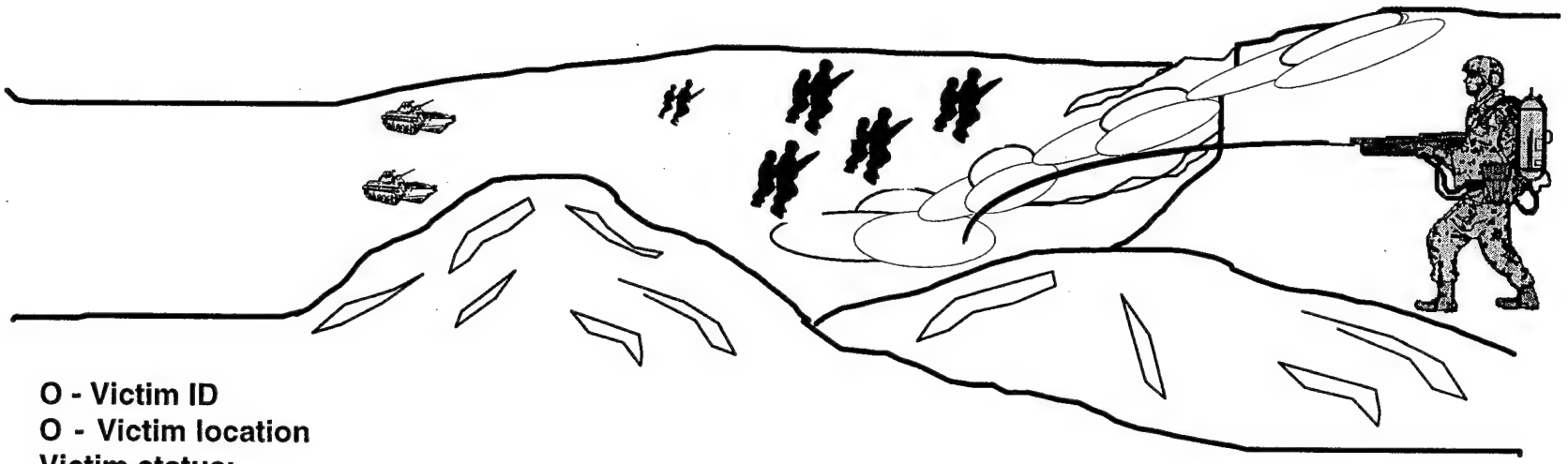
Intrinsic Feedback Functions: Aqueous Foam Barrier



OC

1. Assess victim degree of degradation
   - Provide victims a NEAR MISS indication for IRRITANT warning
   - Execute control gun KILL for WIA's (NON-LETHAL wounds)
2. Ressurect WIA's as required based on self-aid and buddy-aid

Extrinsic Feedback: Aqueous Foam Barrier



O - Victim ID
O - Victim location
Victim status:
- O - Combat effective
- O - Out of action
- O - WIA (NON-LETHAL wounds)

O - Location of breach/lane

O - Shooter ID
O - Shooter location
O - Barrier agent, location, (xyz) dimensions, and orientation

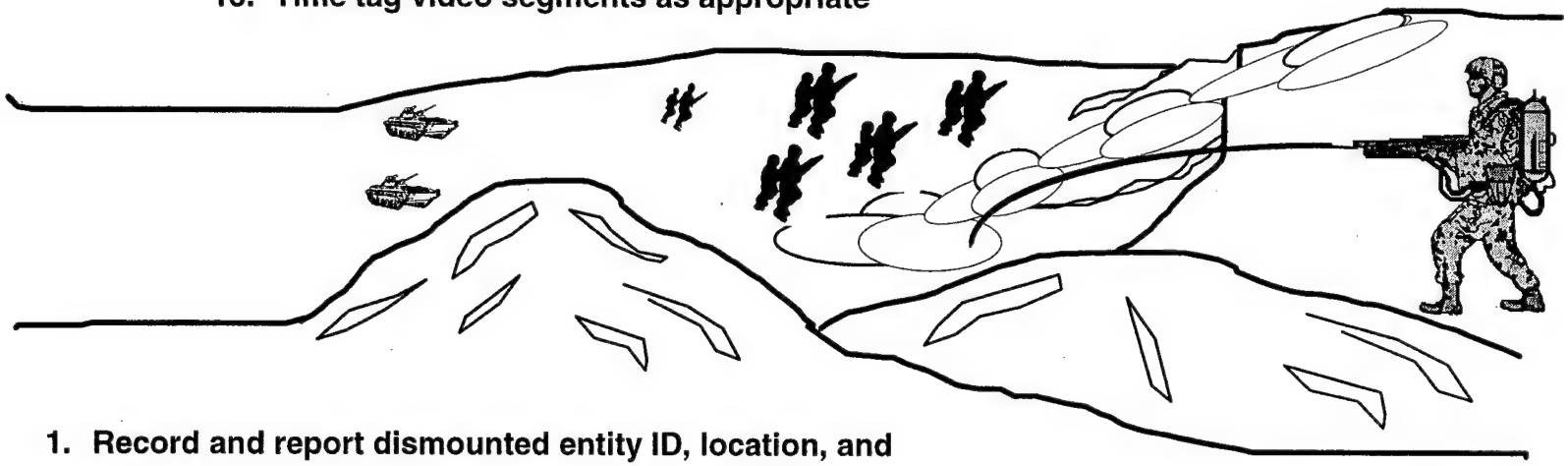
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Aqueous Foam Barrier

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

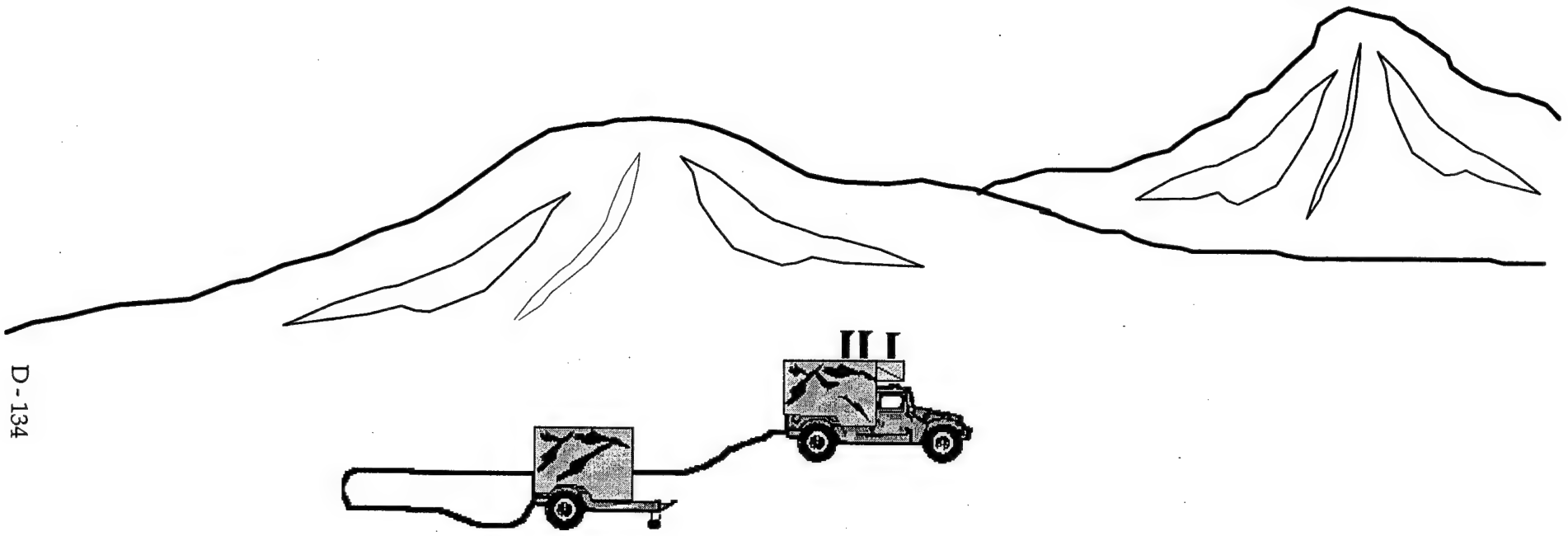
1. Record engagement information from OC
2. Plot barrier location and affected area in TAF workstation
3. Plot location of breach/lanes as required
4. Pan the map to the engagement area
5. Scale/zoom the map to display the engagement
6. Identify and display appropriate BLUFOR control measures
7. Prepare a top down view AAR aid of the engagement
8. Title the AAR aid to provide context and significance
10. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
11. Title the chart to provide context and significance
12. Store aids in AAR bin
13. Time tag video segments as appropriate



OC

1. Record and report dismounted entity ID, location, and status (Combat effective, Out of action, and WIA)
2. Record and report barrier location, barrier agent type, (xyz) dimensions, and orientation
3. Record and report location of breach/lane as required

Intrinsic Feedback: Biological Integrated Detection System (BIDS)



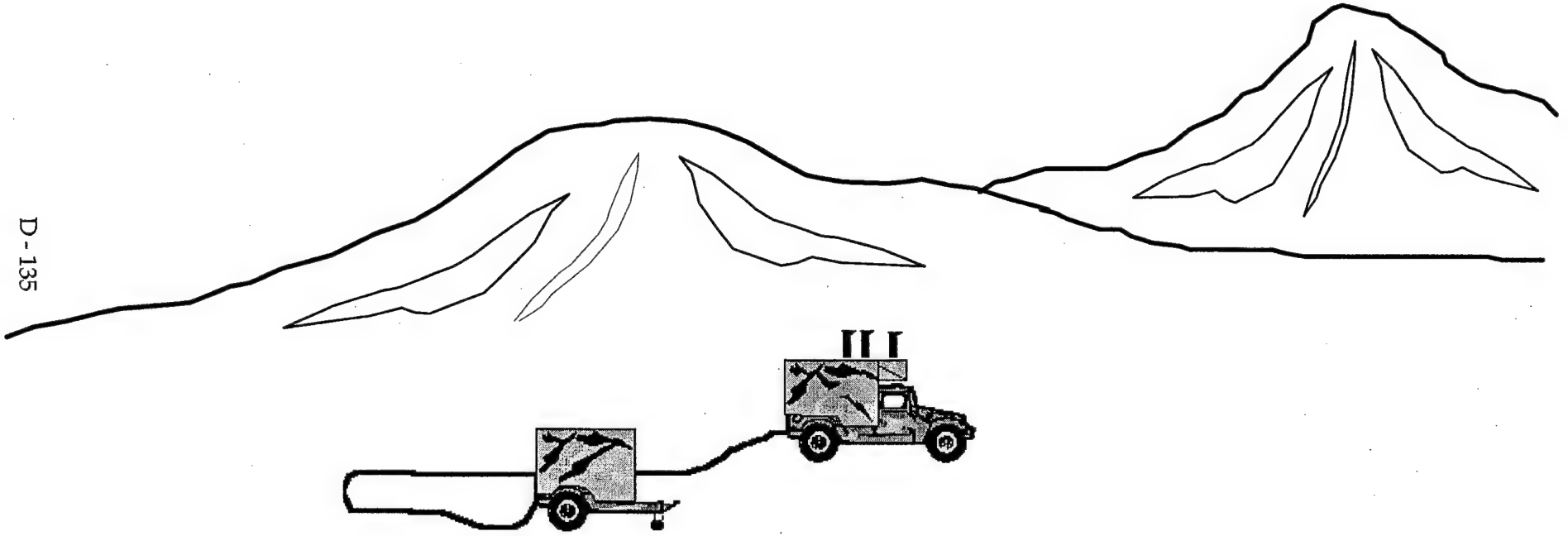
- P - BIDS operators receive feedback from their actions
- P - Players receive feedback from establishment of C4I network
- O - Other players/units receive feedback from their responses to BIDS warnings
- O - Means to stimulate indication of biological agent attack

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Biological Integrated Detection System (BIDS)

TAF Analyst

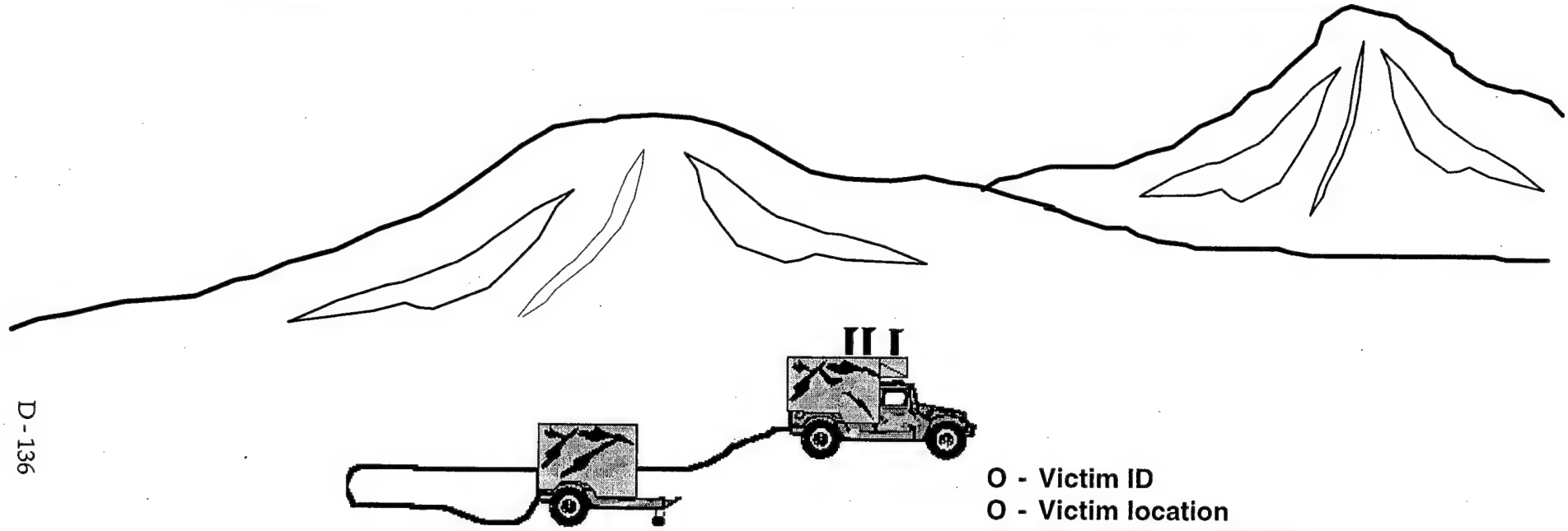
1. Receive biological mission attack data from OPFOR
2. Plot affected area in TAF workstation
3. Validate BIDS location and detection capability
4. Inform OC of type agent and affected area



OC

1. Receive attack location, and agent type from TAF analyst, initiate biological attack
2. Introduce indication of biological agents

Extrinsic Feedback: Biological Integrated Detection System (BIDS)



- O - Victim ID
- O - Victim location
- O - BIDS System location
- O - Weather data
- Victim status:
  - O - Combat Effective
  - O - Out of Action
  - O - WIA (Type wounds)
  - O - KIA
- O - Biological agent type
- O - Type delivery means
- O - Location of delivery means
- O - Geographical area affected
- O - NBC Reports generated
- O - Elements receiving NBC reports

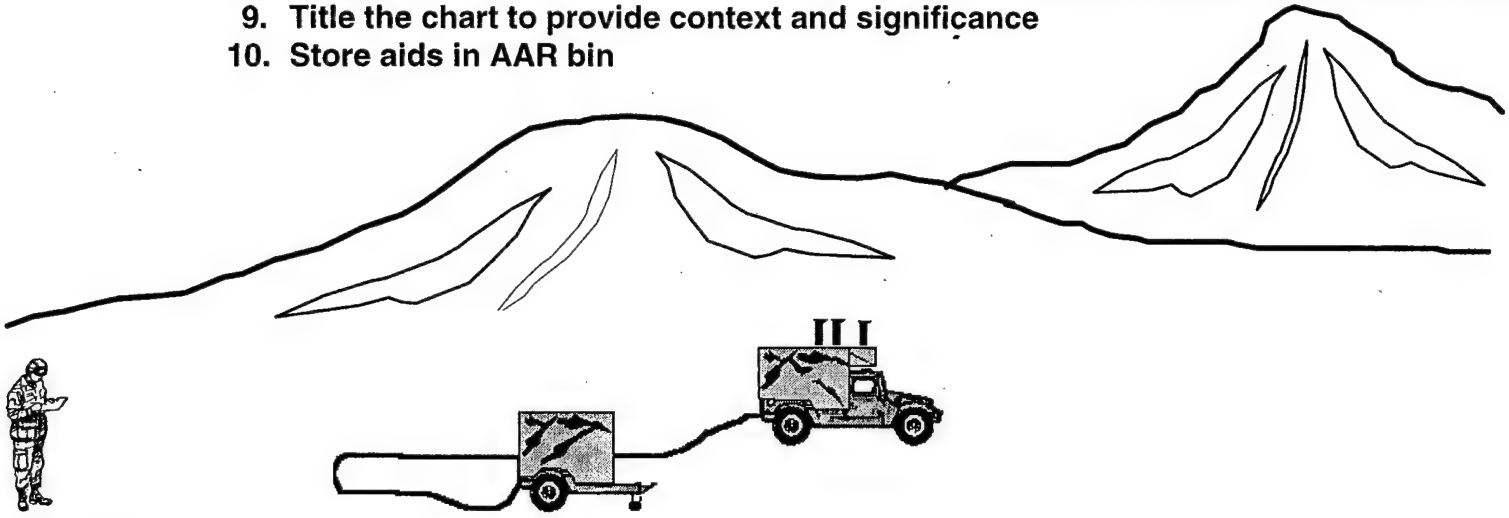
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Biological Integrated Detection System (BIDS)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record BIDS evaluation and casualty information received from OC's
2. Locate biological strike in exercise history
3. Pan the map to the affected area
4. Scale/zoom the map to display the affected area
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the affected area
7. Title the AAR aid to provide context and significance
8. Prepare statistical timeline showing all BIDS detections, dissemination, and casualties
9. Title the chart to provide context and significance
10. Store aids in AAR bin



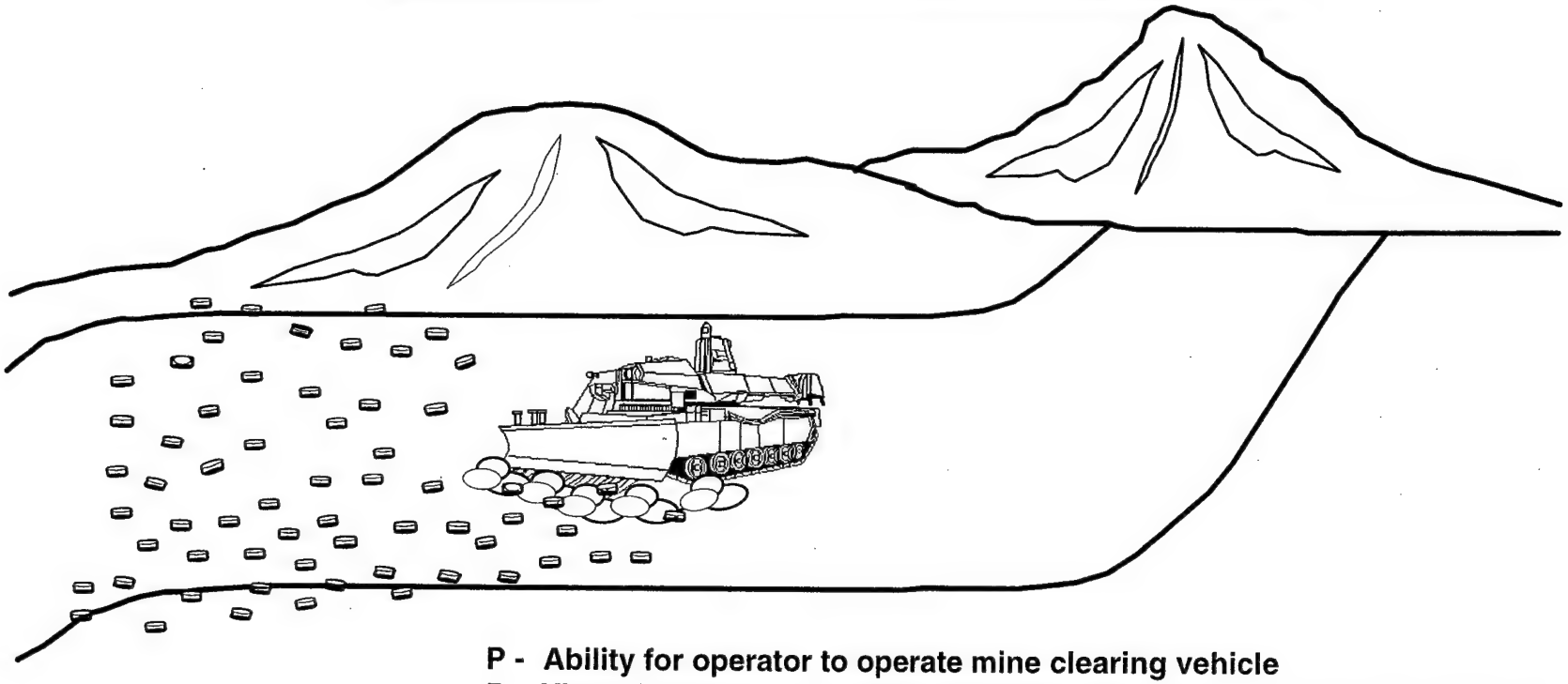
OTHER OC's

1. Determine if NBC report received by player counterpart
2. Announce findings on NBC report dissemination on control net
3. Inform TAF analyst of number of WIA and KIA

OC

1. Evaluate BIDS procedures, report WIA, KIA, and engagement results to TAF analyst
2. Inform TAF analyst and all Task Force OC's of reports sent

Intrinsic Feedback: Grizzly Breaching System



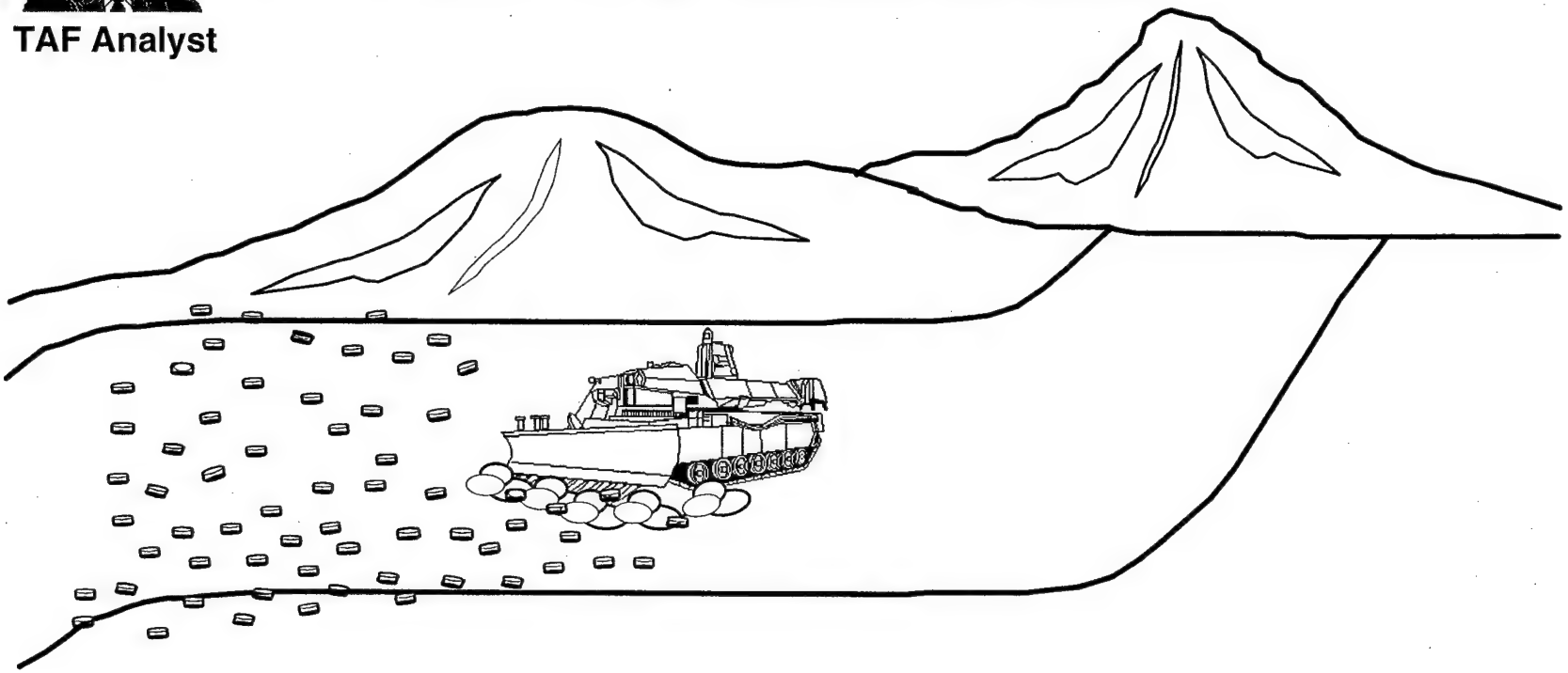
P - Ability for operator to operate mine clearing vehicle
P - Visual indication of natural obstacles (streams, gaps, and free falls) simple obstacles (wire, craters, berms, abatis, minefields) or complex obstacles (combination of natural and simple)
O - Visual/audible indication of mines exploding
Visual/audible indication of mine effects:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Type combat damage

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Grizzly Breaching System

TAF Analyst

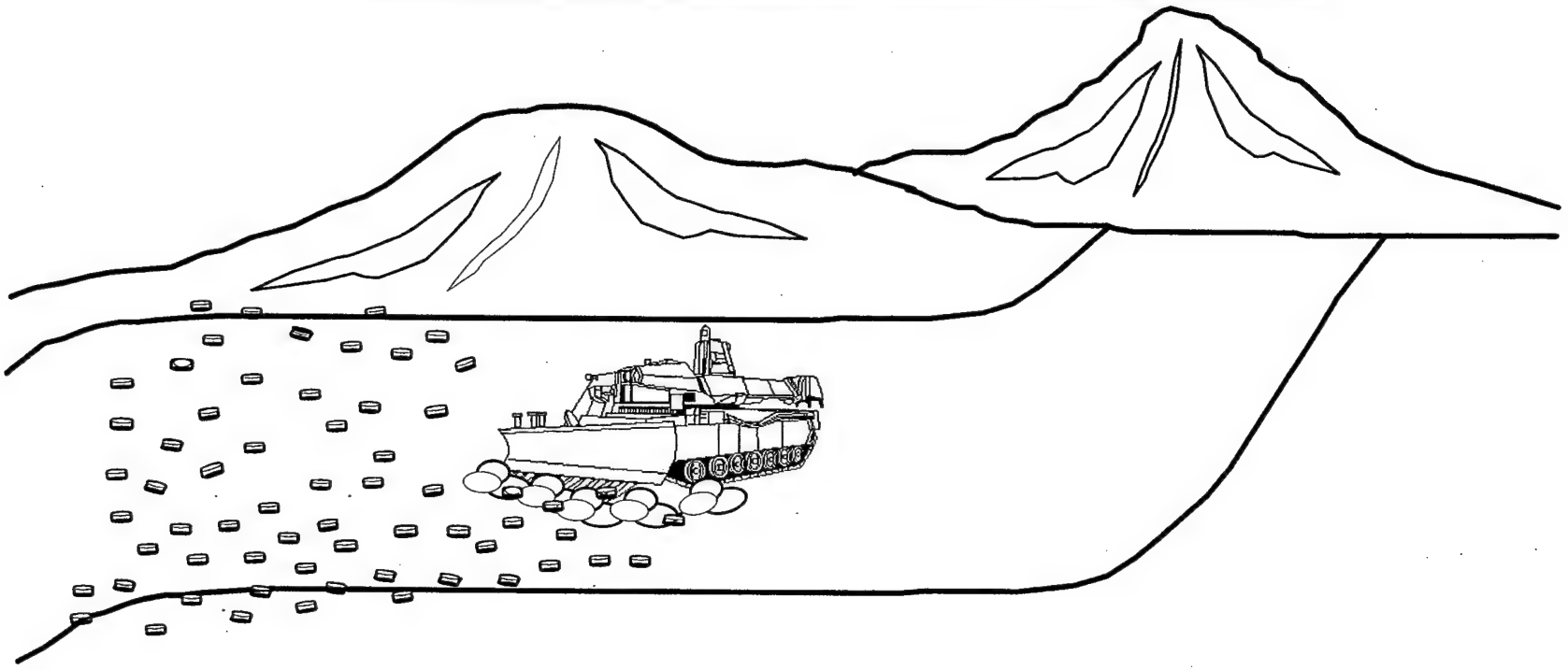
1. Receive obstacle information from OC and enter into TAF workstation
2. Draw breached lane through obstacle when breach complete



OC

1. Monitor procedures used to emplace obstacle
2. Record obstacle type, location, size, orientation, and destruct time (for minefields) and forward information to TAF analyst
3. If breaching vehicle contacts mines mark mine detonation with simulators when required
4. Manually assess ordnance effects on breaching vehicle (Fully operational, Catastrophic kill, Mobility kill, and Type combat damage)
5. Inform TAF analyst when breaching actions complete

Extrinsic Feedback: Grizzly Breaching System



I - Victim ID
I - Victim location
O - Obstacle type, location, size, orientation, and destruct time (for minefields)
Victim status:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Type combat damage

N - Time tagged video display

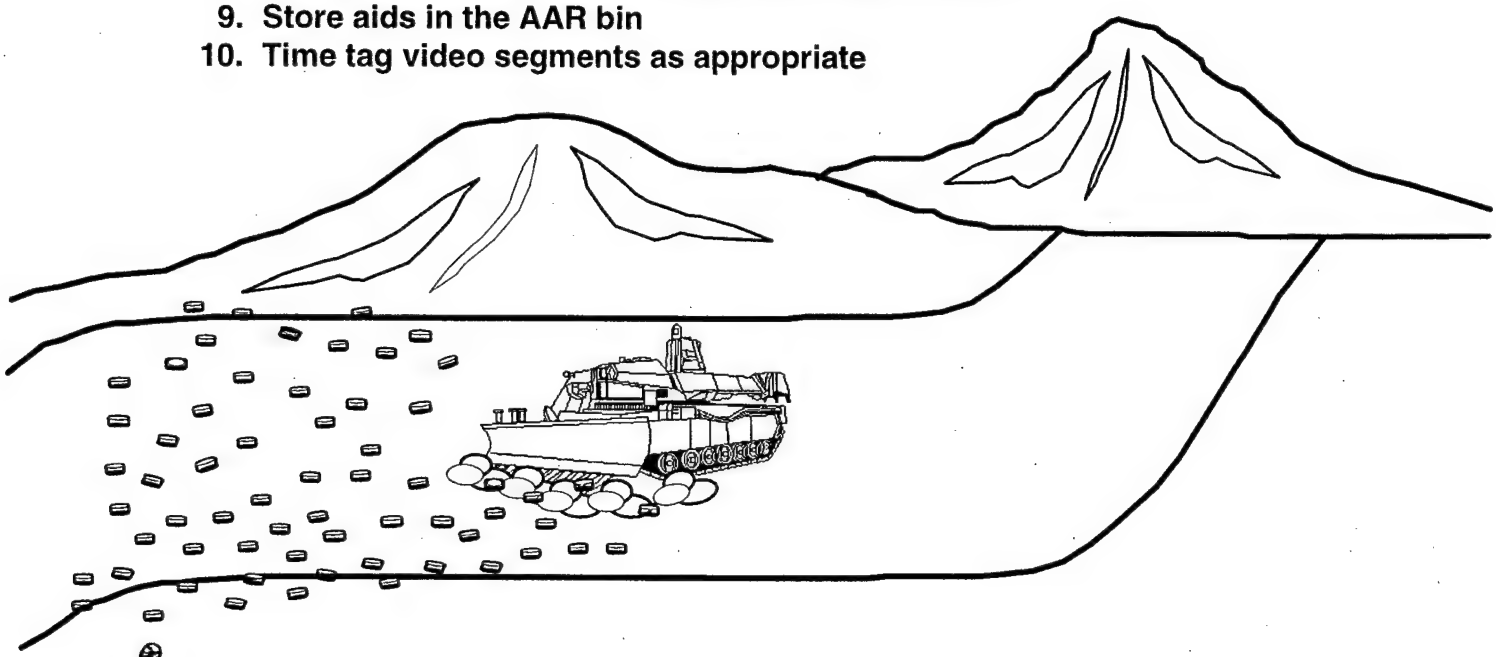
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Grizzly Breaching System

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

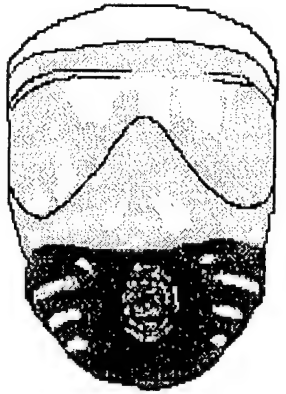
1. Record engagement information form OC
2. Pan the map to the obstacle
3. Scale/zoom the map to display the route cleared through the obstacle
4. Identify and display appropriate BLUFOR control measures
5. Prepare a top down view AAR aid of the obstacle
6. Title the AAR aid to provide context and significance
7. Prepare statistical chart showing the obstacle breaching results
8. Title the chart to provide context and significance
9. Store aids in the AAR bin
10. Time tag video segments as appropriate



OC

1. Record and report manually adjudicated casualty and battle damage assessments

Intrinsic Feedback: Joint Service General purpose Mask



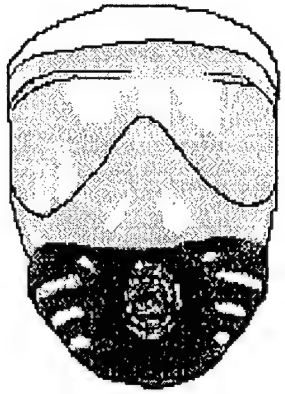
P - Players receive feedback from masking procedures
O - Visual/audible indication of chemical attack
O - Players receive feedback from their responses to warnings (MOPP procedures, vehicle overpressurization)
O - Players receive feedback from MOPP gear exchange, and decontamination actions
Victim indication of attack results:
- O - Combat Effective
- O - Out of Action
- O - WIA (Type wounds)
- O - KIA

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Joint Service General Purpose Mask

TAF Analyst

1. Receive Biological/Chemical mission attack data from OPFOR
2. Plot affected area in TAF workstation
3. Inform OC of attack location, area affected, and agent type

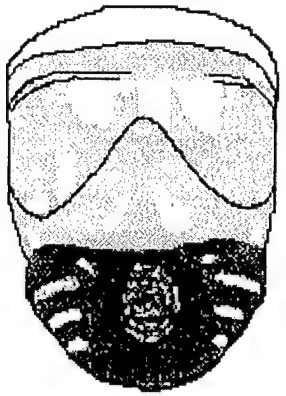


OC

1. Receive attack information from TAF Analyst
2. Mark location of Biological/Chemical attack with exploding ordnance
3. Initiate indication of correct Biological/Chemical attack
4. Assess casualties as required based on reaction to biological/chemical attack

NOTE:
Once chemical attack initiated, player interactions with other players and tactical equipment meet all intrinsic feedback requirements

Extrinsic Feedback: Joint Service General Purpose Mask



O - Victim ID
O - Victim location
I - Weather data
Victim status:
- O - Combat effective
- O - Out of Action
- O - WIA (Type wounds)
- O - KIA

O - Chemical agent type
O - Geographical area affected
O - Type delivery means
O - Location of delivery means
O - NBC Reports generated
O - Elements receiving NBC reports

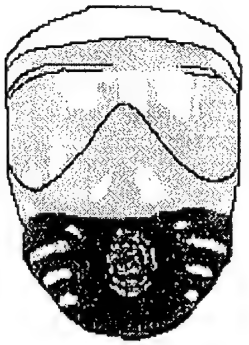
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Joint Service General Purpose Mask

OC and TAF analysts intrinsic control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record engagement information received from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing WIA and KIA from engagement
9. Title the chart to provide context and significance
10. Store aids in AAR bin

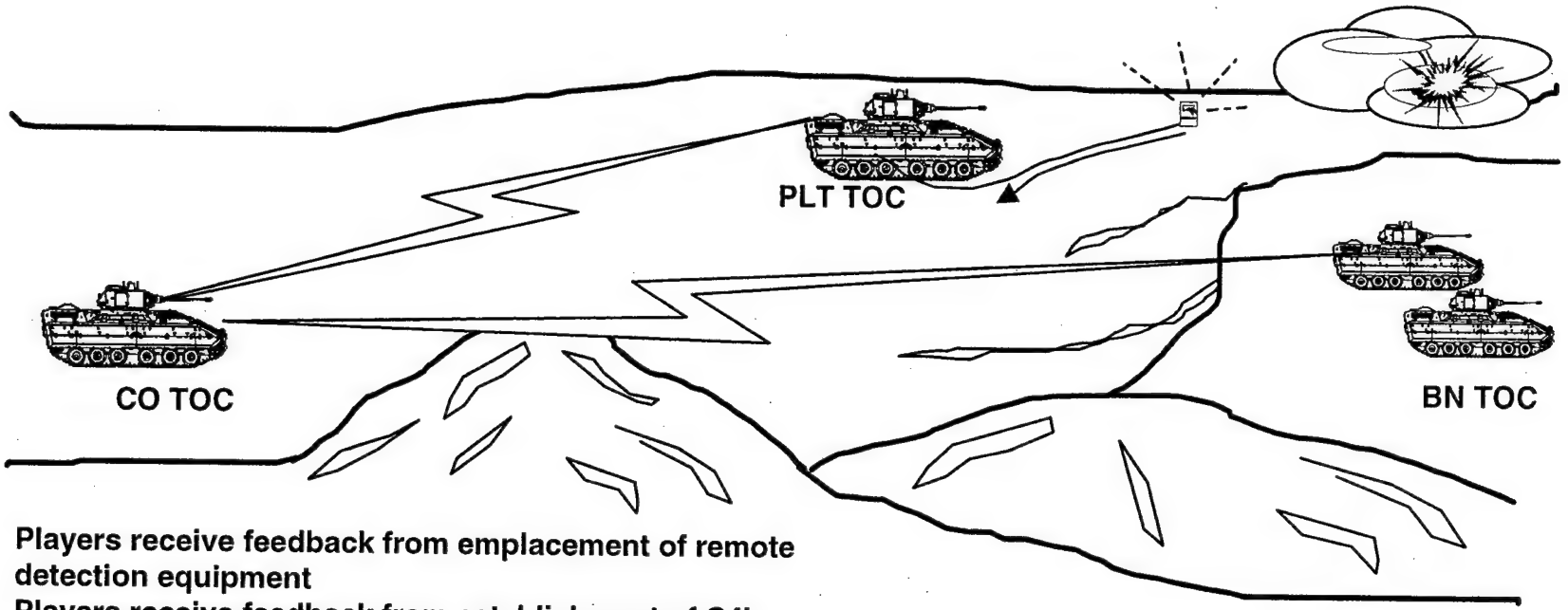


OC

1. Record and report Combat effective, Out of action, WIA's and KIA's from masking procedures assessment
2. Record and report to TAF analyst and all Task Force OC's the NBC reports sent
3. Determine if NBC report received by player counterpart

Intrinsic Feedback: Multi-Purpose Integrated Chemical Agent Alarm (MICAD)

O - Visual/audible indication of chemical attack



P - Players receive feedback from emplacement of remote detection equipment

P - Players receive feedback from establishment of C4I network

O - Players receive feedback from MOPP gear exchange, filter replacement, and decontamination actions

O - Players receive feedback from their responses to warnings (MOPP procedures, vehicle overpressurization)

O - Visual/audible indication of agent detection alarm activation

Visual indication of ordnance effects:

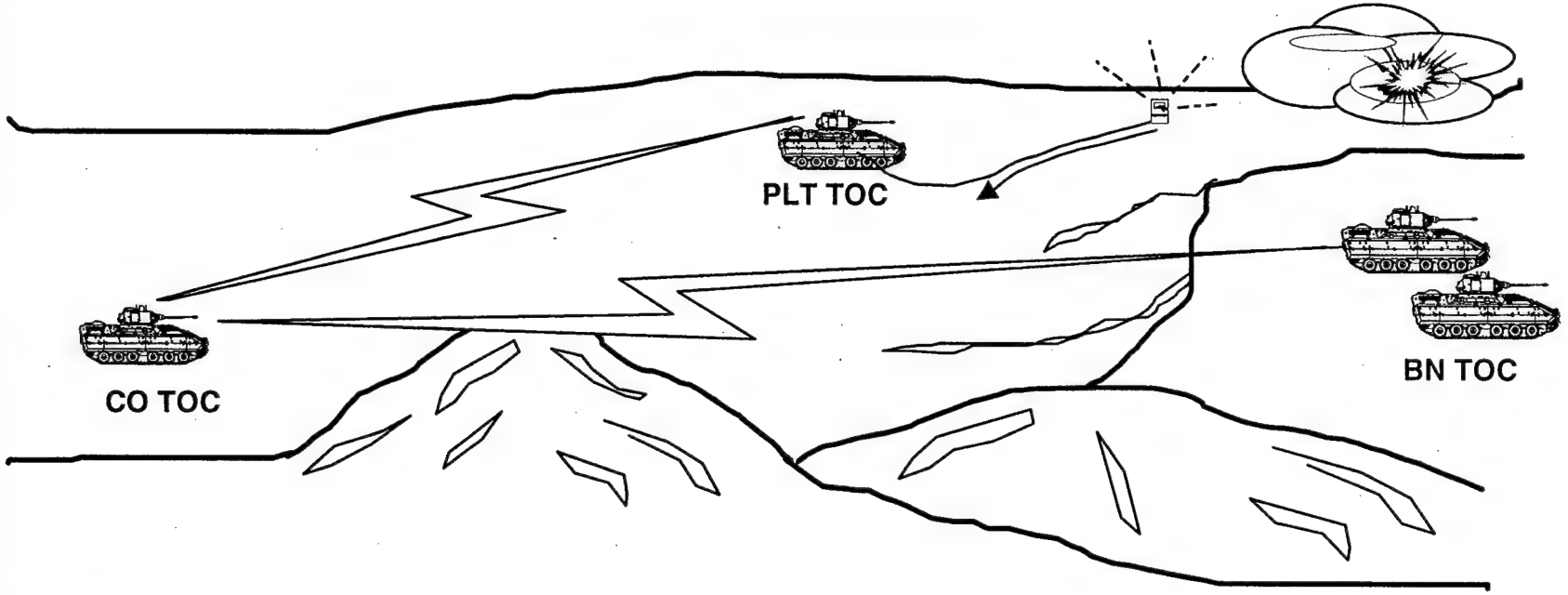
- O - Combat Effective
- O - Out of Action
- P - WIA (Type of wounds)
- P - KIA

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Multi-Purpose Integrated Chemical Agent Alarm (MICAD)

TAF Analyst

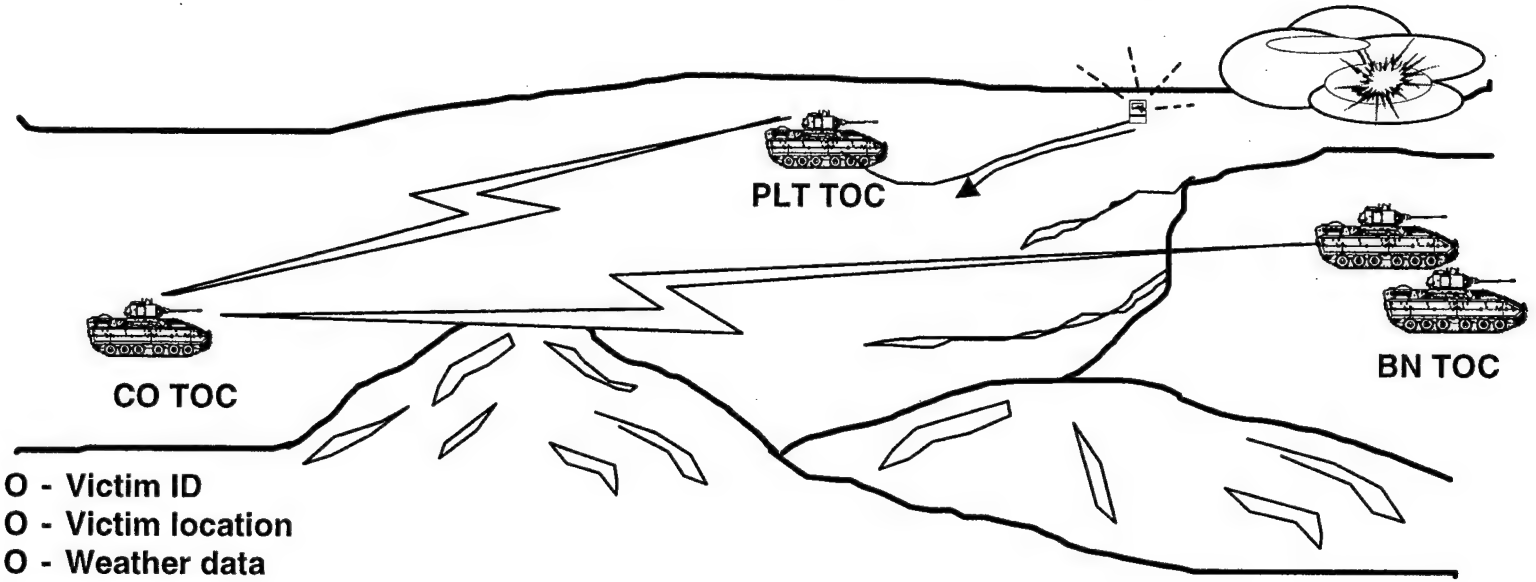
1. Receive chemical mission attack data from OPFOR
2. Plot affected area in TAF workstation for SAWE assessment
3. Inform OC of attack location, area affected, and agent type



OC

1. Receive attack location, and agent type from TAF analyst, initiate chemical attack
2. Mark location of chemical attack with exploding ordnance
3. Introduce indication of correct chemical agent type

Extrinsic Feedback: Multi-Purpose Integrated Chemical Agent Alarm (MICAD)



O - Victim ID
O - Victim location
O - Weather data
Victim status:
- O - Combat effective
- O - Out of Action
- O - WIA (Type wounds)
- O - KIA

O - Chemical agent type
O - Geographical area affected
O - Type delivery means
O - Location of delivery means
O - NBC Reports generated
O - Elements receiving NBC reports
N - MICAD sensors location

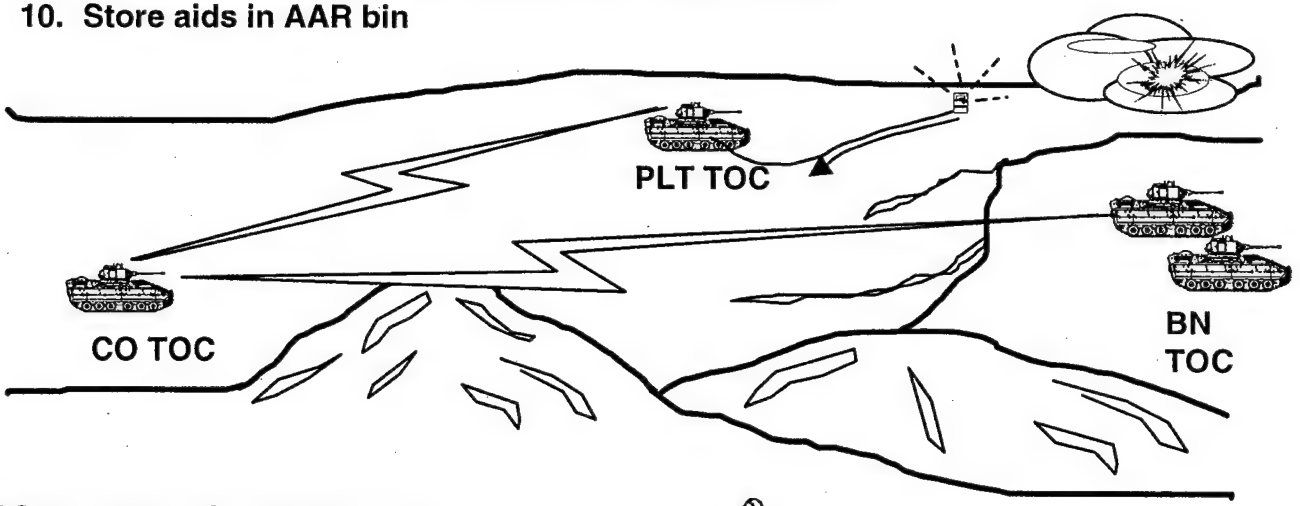
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Multi-Purpose Integrated Chemical Agent Alarm (MICAD)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record MICAD evaluation and casualty information received from OC's
2. Locate chemical strike in exercise history
3. Pan the map to the affected area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the affected area
7. Title the AAR aid to provide context and significance
8. Prepare statistical timeline showing all MICAD detections, dissemination, and casualties
9. Title the chart to provide context and significance
10. Store aids in AAR bin



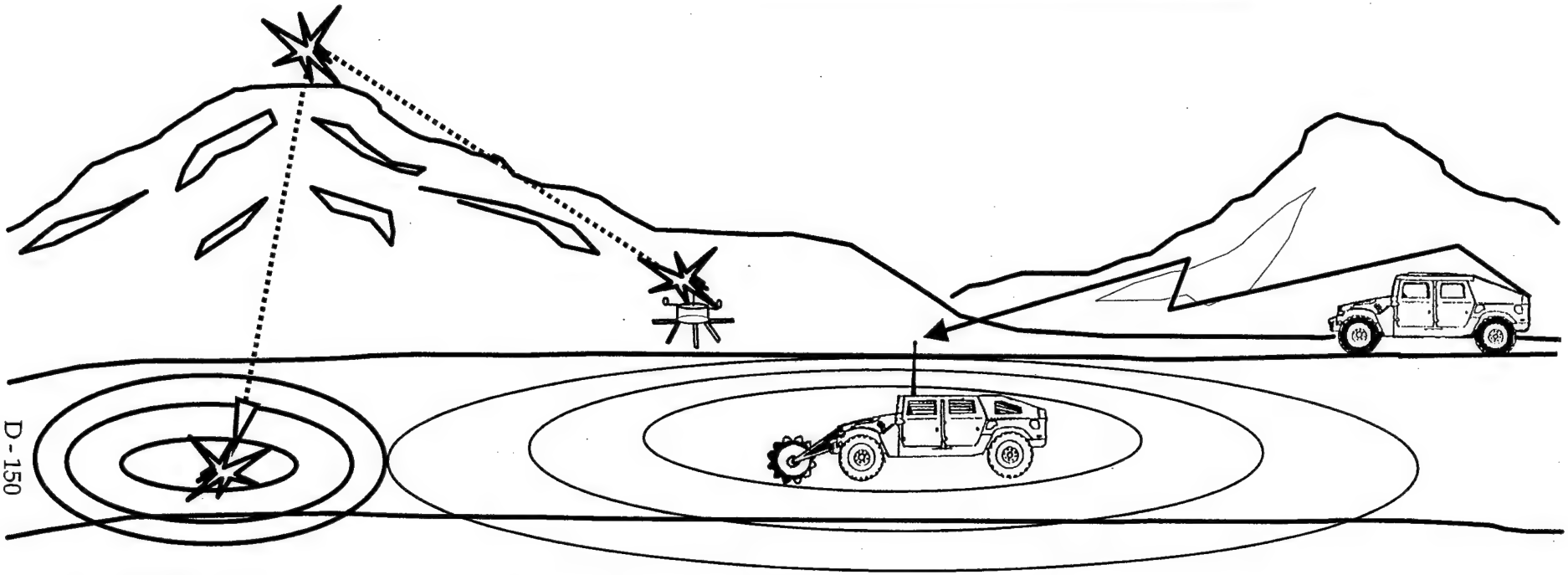
OTHER OC's

1. Determine if NBC report received by player counterpart
2. Announce findings on NBC report dissemination on control net
3. Inform TAF analyst of number of WIA and KIA

OC

1. Evaluate MICAD procedures, report WIA, KIA, and engagement results to TAF analyst
2. Inform TAF analyst and all Task Force OC's of reports sent

Intrinsic Feedback: Off Route Smart Mine Clearance



P - Ability for operator to remotely control movement of mine clearing vehicle
O - Visual/audible signature of exploding dumb mines
Indication of remote vehicle status:
- O - Fully operational
- O - Catastrophic kill
- P - Type combat damage

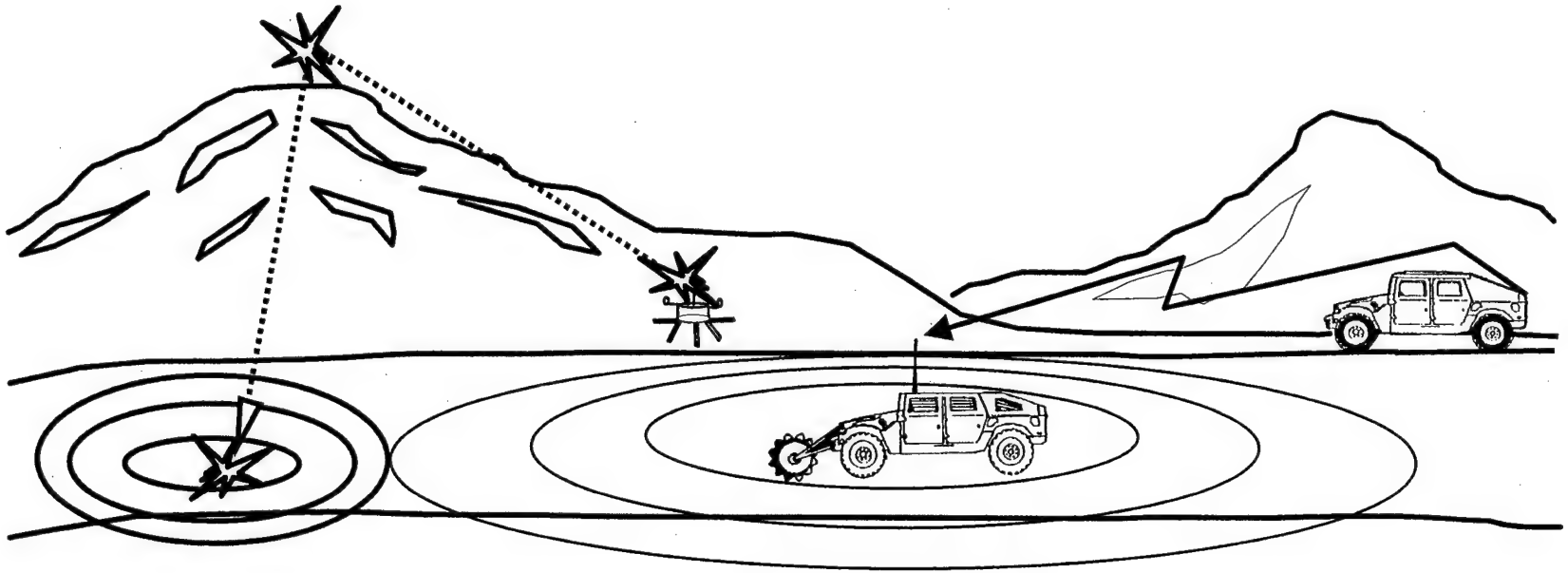
O - Visual/audible signature of exploding smart mines (seismic, acoustic) from radiating signals

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Off Route Smart Mine Clearance

OC

1. Record location of smart mines received from TAF analyst
2. Notify TAF analyst when unit dispatches ORSMC and provide initial start location and planned route
3. If remote vehicle runs over dumb mine (blue concrete or wood simulated mine) kill remote vehicle with control gun and inform TAF analyst



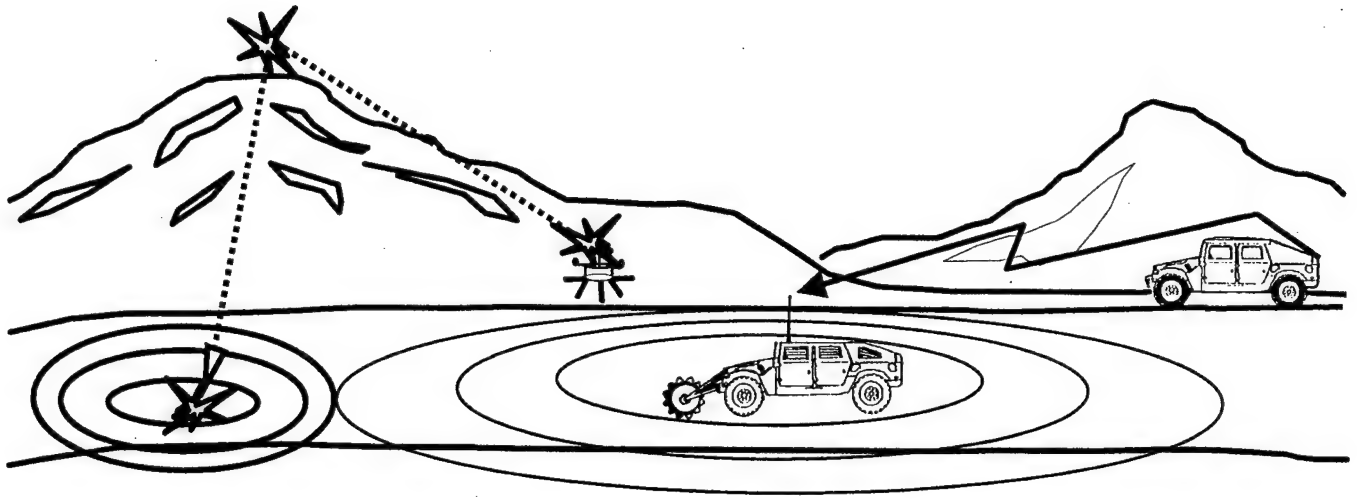
Firemarker

1. Record smart mine locations received from TAF analyst
2. Navigate to location of impacting ordnance
3. Mark smart mine detonation when directed by TAF analyst
4. Notify TAF analyst when fires marked

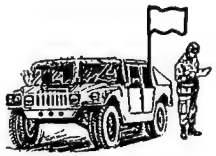
Intrinsic Feedback Functions: Off Route Smart Mine Clearance

TAF Analyst

1. Coordinate with OPFOR TAF LNO on smart mine locations
2. Annotate smart mine locations on TAF workstation
3. Inform OC and firemarker of smart mine locations
4. Direct firemarker(s) to vicinity of OPFOR smart mine locations
5. Monitor remote vehicle movement with range of radiating signals visible on TAF workstation, as remote vehicle approaches smart mines, direct firemarkers to mark mine detonation
6. If another player vehicle(s) enters effective radius of smart mine or dumb mine while ORSMC is clearing route, administratively kill vehicle(s) from TAF
7. Upon conclusion of route clearance, notify OC to mark and manually assess damage to additional vehicles from remaining mines as required, and report results

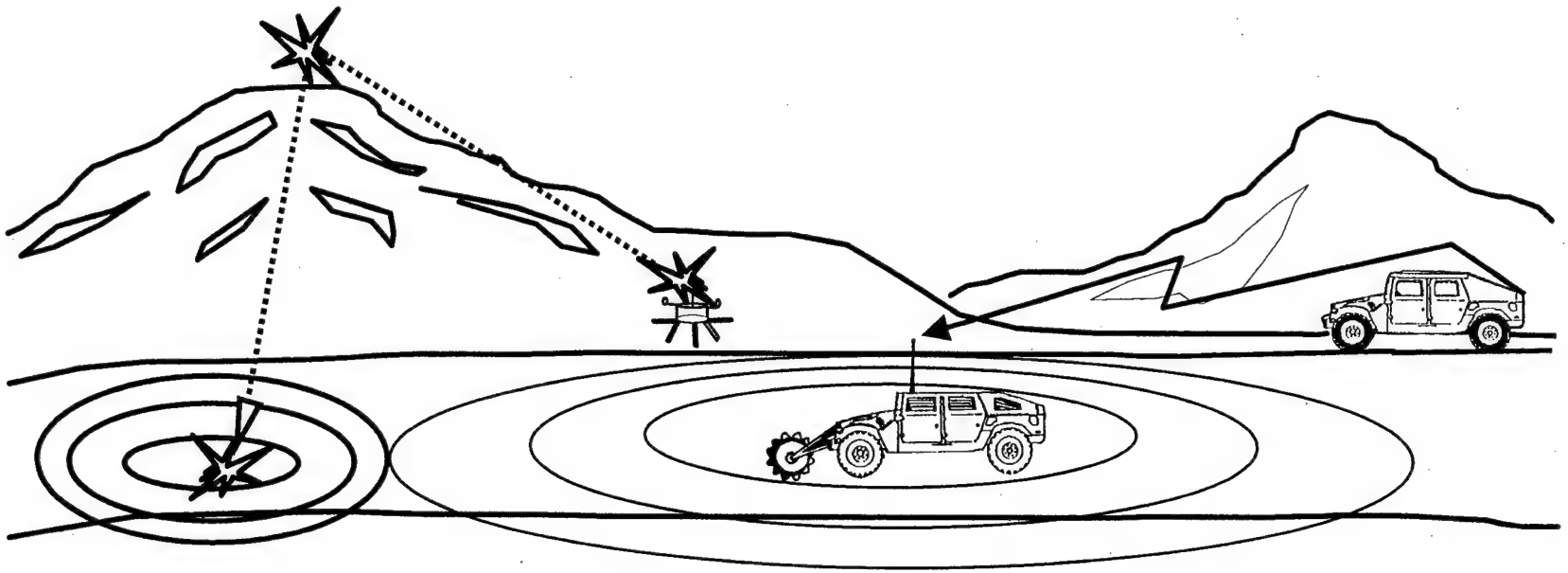


OC



Firemarker

Extrinsic Feedback: Off Route Smart Mine Clearance



I - Control Vehicle ID
I - Remote Vehicle ID
I - Control Vehicle location
I - Remote Vehicle location
I - Actual remote vehicle route taken (snail trail)
O - Planned remote vehicle route
O - Radiating fans to mark remote vehicle range
O - Mine locations, density, orientation, and type
O - Mines detonated by type
Remote Vehicle status:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Type combat damage

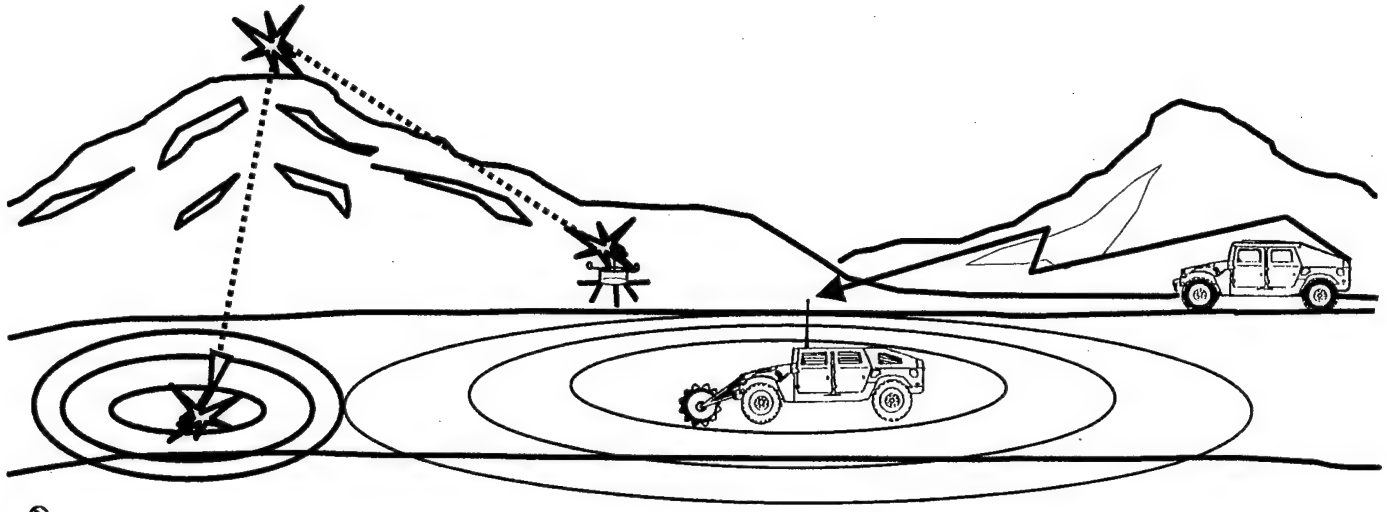
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Off Route Smart Mine Clearance

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

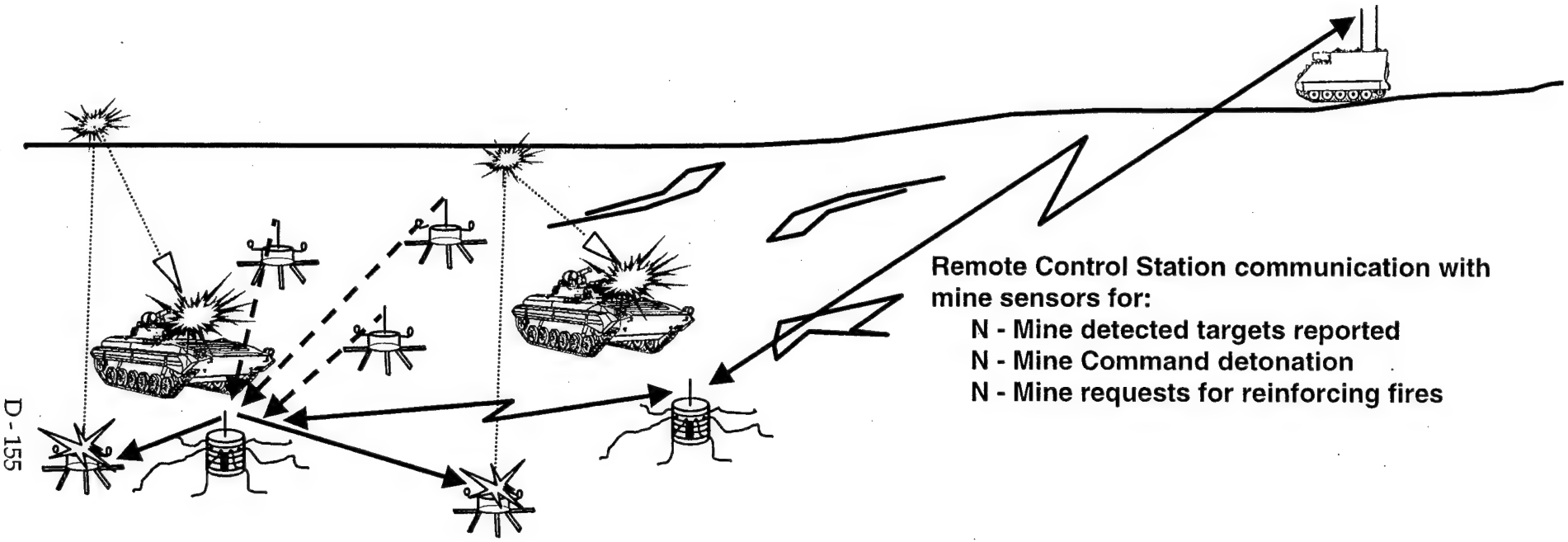
1. Record engagement information form OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the route cleared with the ORSMC
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing the ORSMC mission results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin
11. Time tag video segments as appropriate



OC

1. Record and report manual assessments for smart and dumb mine detonations

Intrinsic Feedback: RAPTOR-Intelligent Combat Outpost



Remote Control Station communication with mine sensors for:

- N - Mine detected targets reported
- N - Mine Command detonation
- N - Mine requests for reinforcing fires

O - Visual/audible indication of mines exploding

Visual/audible indication of mine effects:

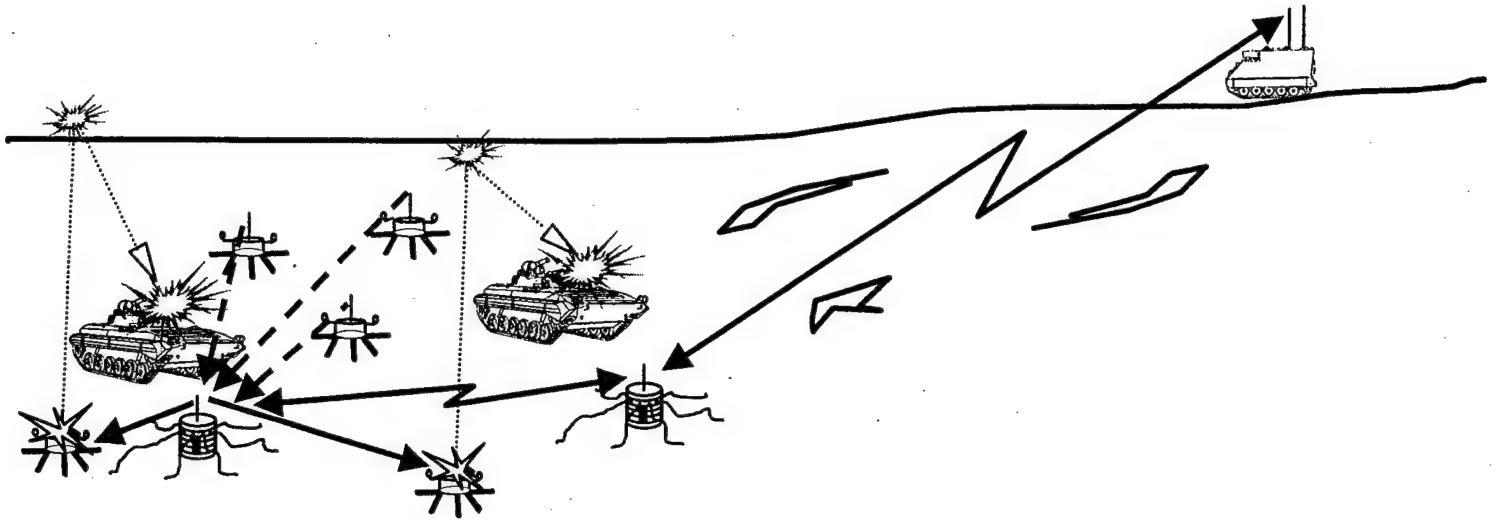
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Firepower kill
- O - Communications kill
- P - Type combat damage

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: RAPTOR-Intelligent Combat Outpost

TAF Analyst

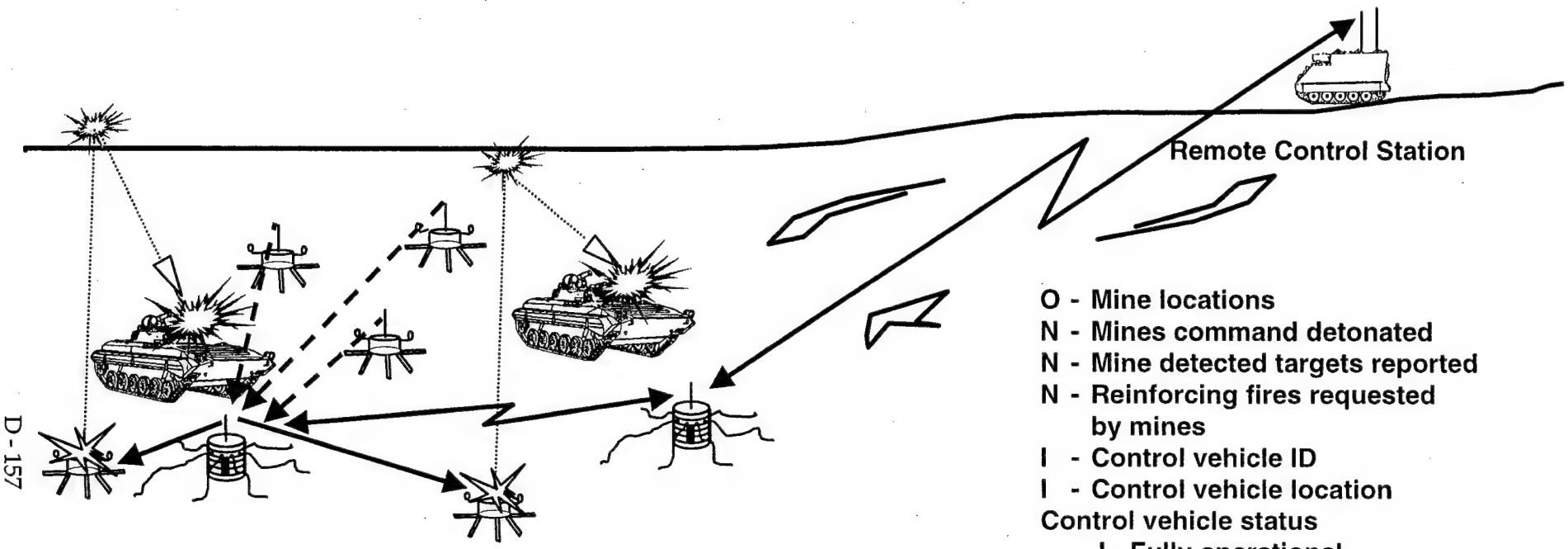
1. Receive mine location information from OC
2. Assign a number to each mine and enter mine locations into TAF workstation
3. As vehicles approach mines inform OC
4. Record instrumented battle damage and OC manual assessments as required



OC

1. Monitor emplacement of minefield and record grid location of each mine and inform TAF analyst
2. When notified by TAF that vehicle is approaching mine, mark engagement with signal flare, and grenade simulator
3. Manually assess minefield effects during breaching operations

Extrinsic Feedback: RAPTOR-Intelligent Combat Outpost



O - Mine locations
N - Mines command detonated
N - Mine detected targets reported
N - Reinforcing fires requested by mines
I - Control vehicle ID
I - Control vehicle location
Control vehicle status
- I - Fully operational
- I - Catastrophic kill
- I - Mobility kill
- I - Communications kill

O - Victim ID
O - Victim location
Victim status:
- O - Fully operational
- O - Catastrophic kill
- O - Mobility kill
- O - Firepower kill
- O - Communications kill
- O - Type combat damage

O - Kill code

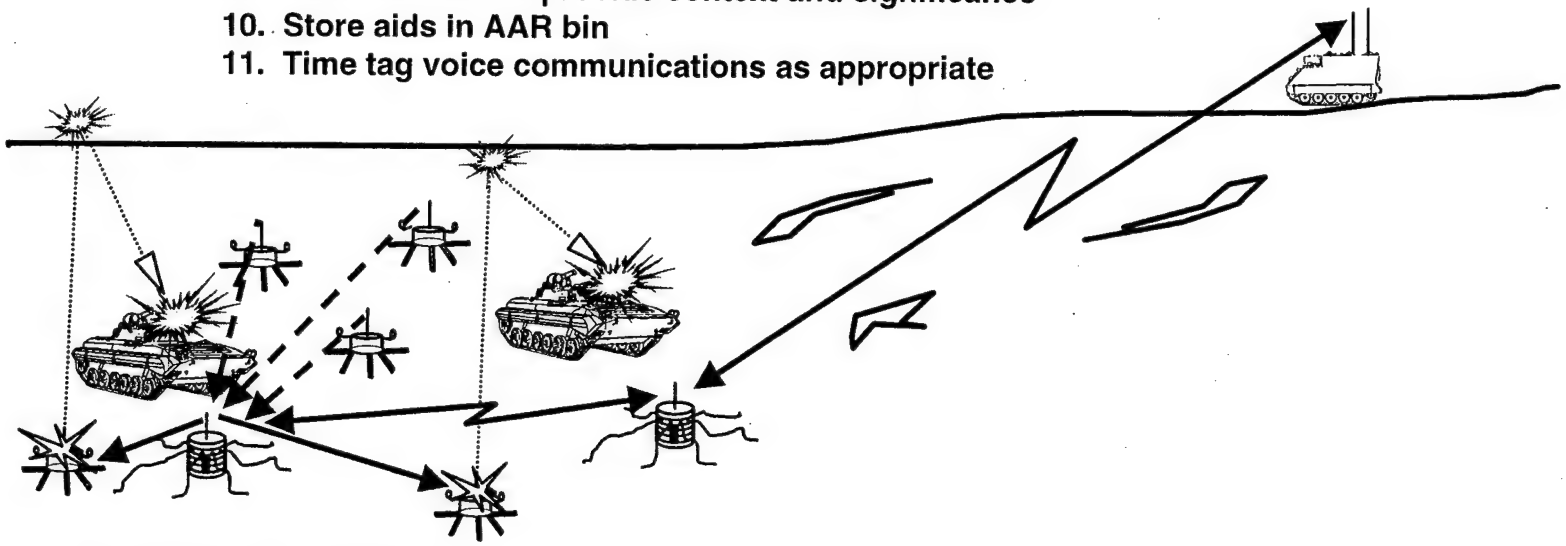
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: RAPTOR-Intelligent Combat Outpost

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

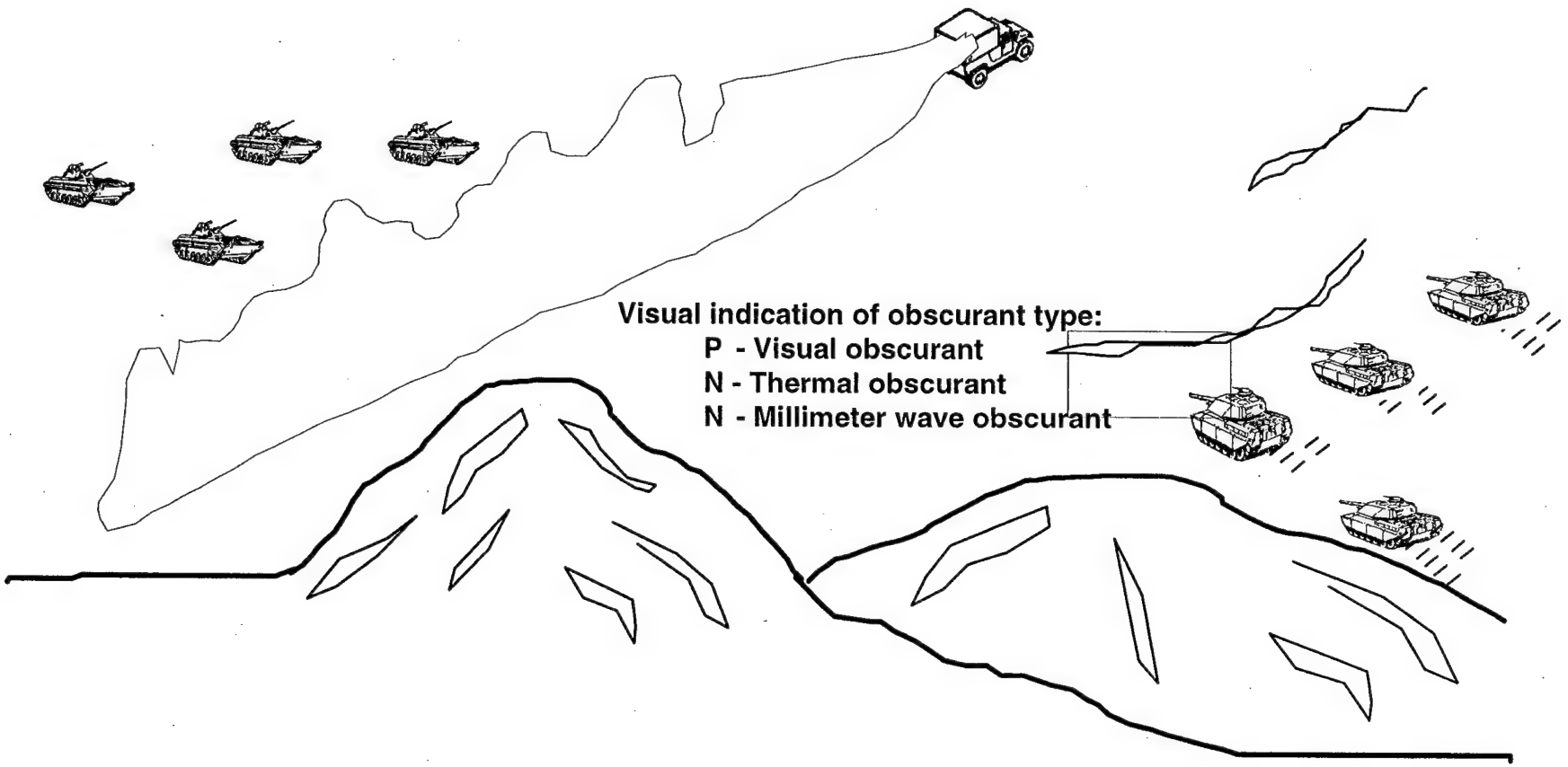
1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top-down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag voice communications as appropriate



OC

1. Record and report victim ID, location, and type combat damage for non-instrumented vehicles
2. Record and report type combat damage for SAWE and manually adjudicated assessments
3. Obtain and record "kill codes" and type combat damage for BLUFOR victims
4. Obtain and record "kill codes" for OPFOR victims
5. Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, and MILES limitations)

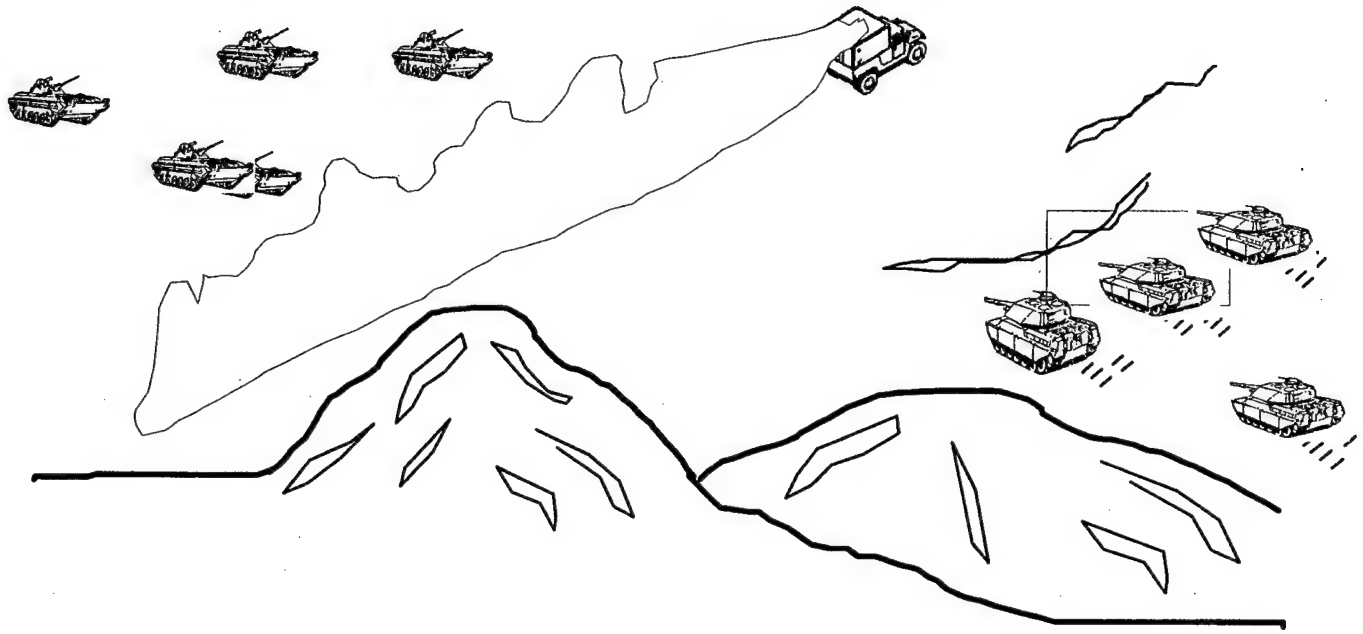
Intrinsic Feedback: M56 Smoke Generator



N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

If exercise players can employ actual thermal and millimeter wave obscurants, N = P.

Intrinsic Feedback Functions: M56 Smoke Generator

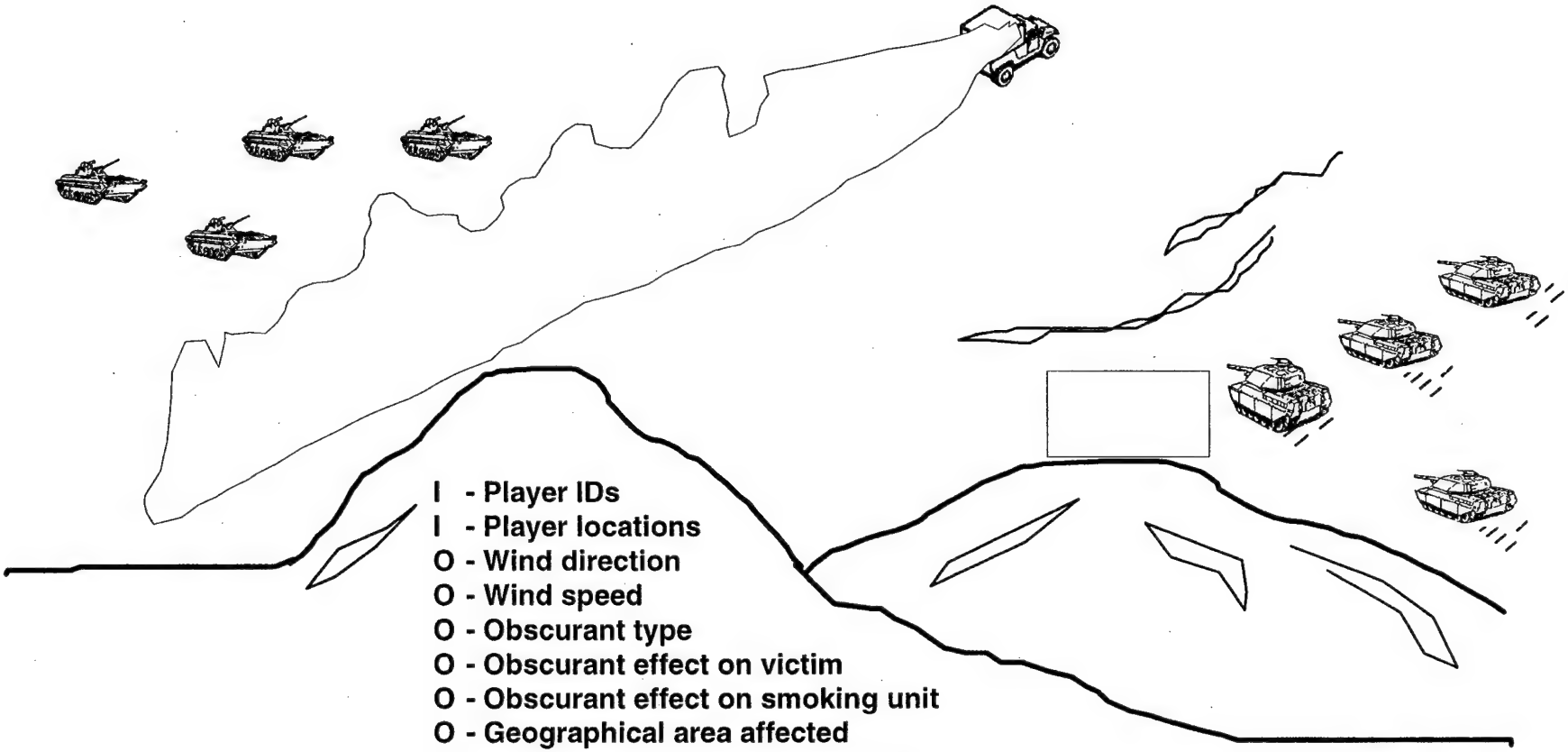


NOTES:

No OC or TAF analyst control tasks needed if players employ organic smoke assets

Presumes actual smoke with visual, thermal, or millimeter wave obscurants employed

Extrinsic Feedback: M56 Smoke Generator



I - Player IDs
I - Player locations
O - Wind direction
O - Wind speed
O - Obscurant type
O - Obscurant effect on victim
O - Obscurant effect on smoking unit
O - Geographical area affected
N - Location of shooter and victim when inter-visible and exposure time

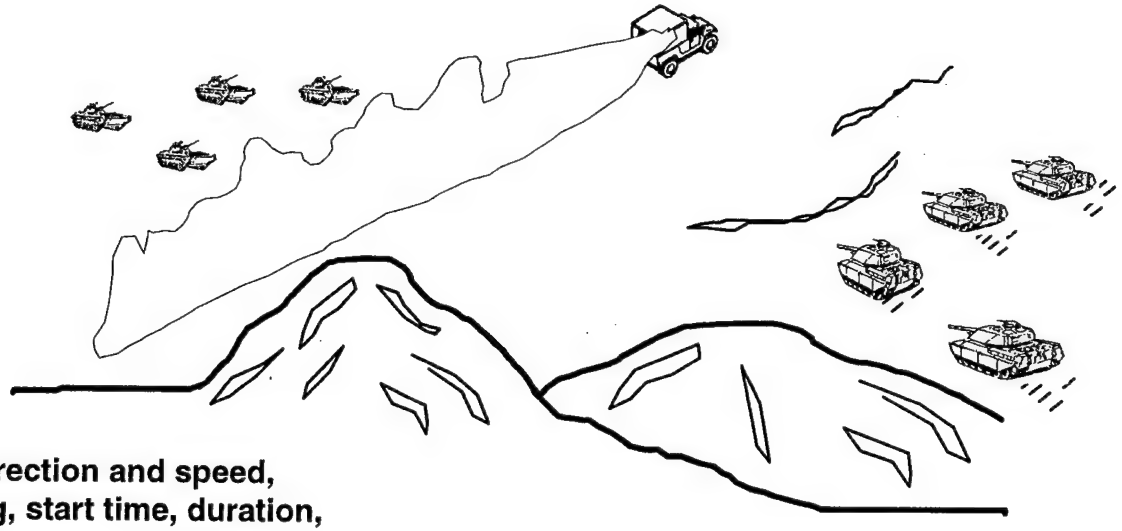
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: M56 Smoke Generator

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record Smoke Generator information received from OC
2. Enter and plot area obscured into TAF workstation
3. Scale/zoom the map to display the obscurant engagement area
4. Identify and display appropriate BLUFOR control measures
5. Prepare a top down view AAR aid of engagement
6. Title the AAR aid to provide context and significance
7. Prepare statistical chart showing the results of obscurant engagement
8. Title the chart to provide context and significance
9. Store aids in the AAR bin
10. Time tag video segments as appropriate

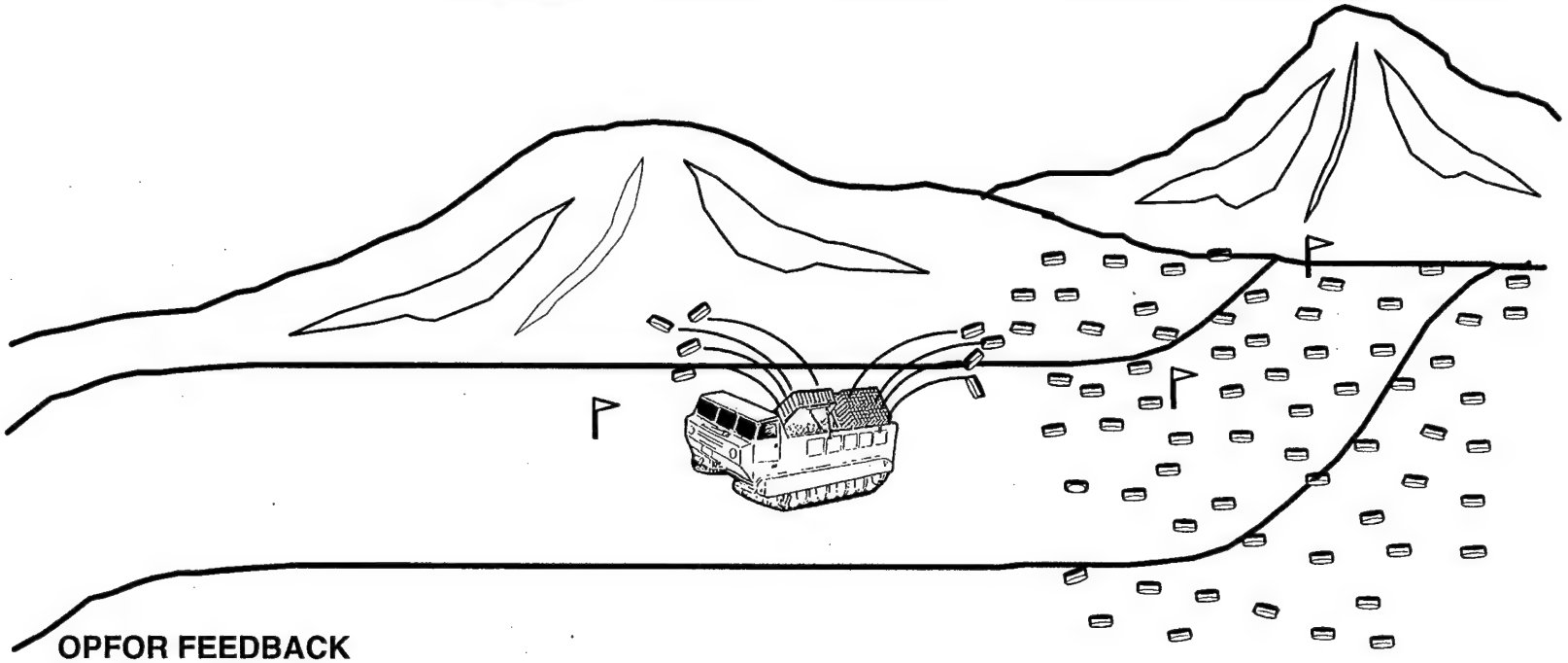


OC

1. Determine wind direction and speed, vehicle positioning, start time, duration, and type smoke employed
2. Record obscurant effects on player and OPFOR

NOTE: Presumes actual smoke with visual, thermal, or millimeter wave obscurants employed.

Intrinsic Feedback: Volcano Mine System (Ground Emplaced)



OPFOR FEEDBACK

P - Visual means to identify mine locations

Visual/audible indication of mine effects:

- O - Fully operational
- O - Catastrophic kill

O - Visual/audible indication of mines exploding

BLUFOR FEEDBACK

P - Visual means to identify mines locations (players hand emplace mines)

Visual indication of mine effects:

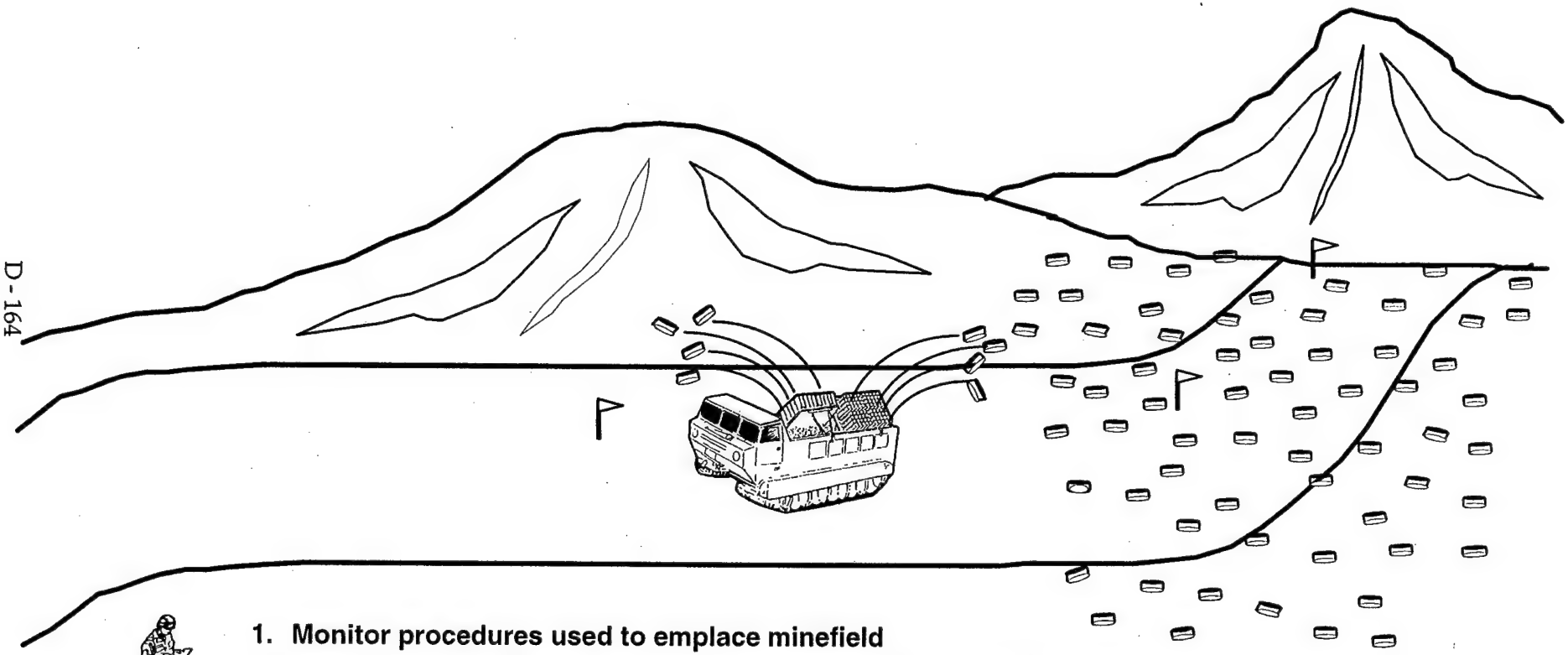
- P - Fully operational
- P - Catastrophic kill
- P - Combat effective
- P - Out of action

O - Visual indication of mines exploding

N - Player capability to employ actual Volcano equipment

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

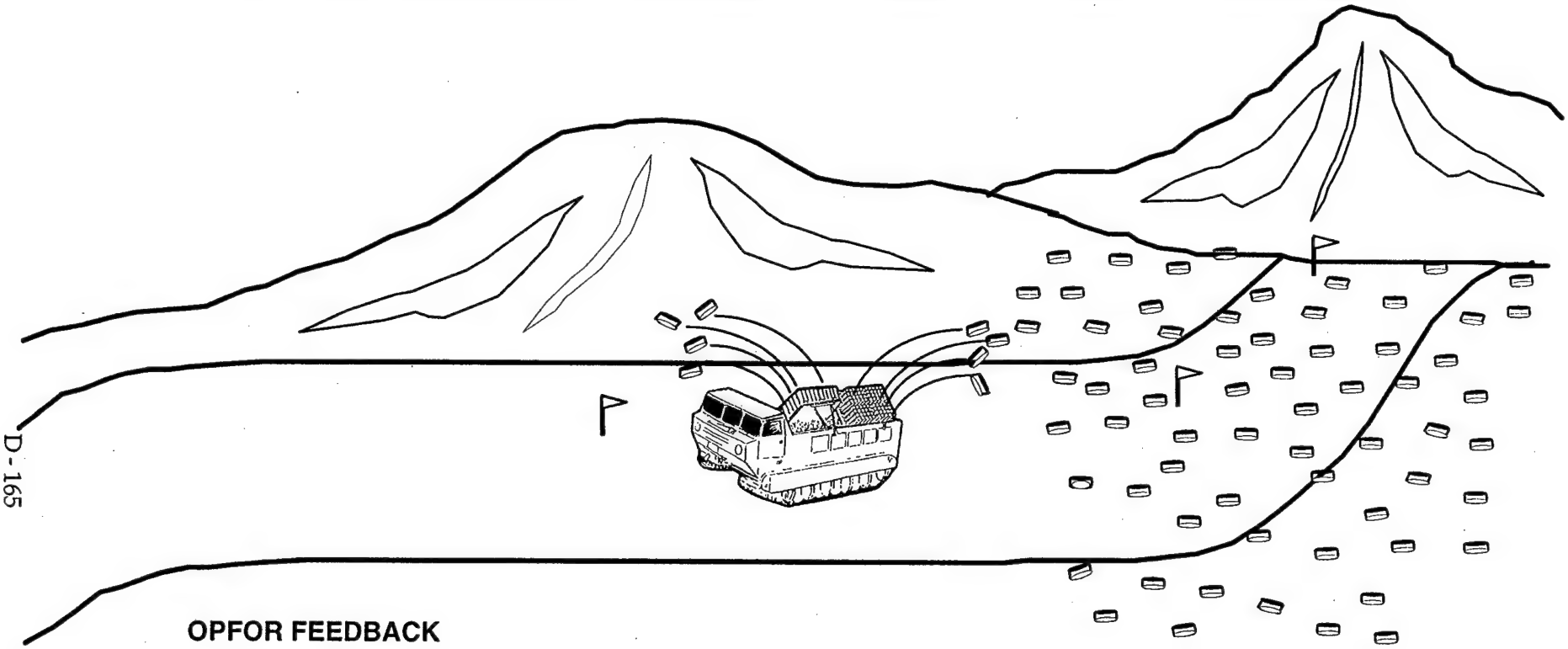
Intrinsic Feedback Functions: Volcano Mine System (Ground Emplaced)



OC

1. Monitor procedures used to emplace minefield
2. Record minefield type, location, size, orientation, and destruct time
3. When vehicle approaches mine, mark engagement with grenade simulator
4. Manually adjudicate minefield effects for battle damage and casualties

Extrinsic Feedback: Volcano Mine System (Ground Emplaced)



OPFOR FEEDBACK
- O - Victim ID
- O - Victim location

Victim status:
- O - Fully operational
- O - Catastrophic kill

BLUFOR FEEDBACK
- O - Minefield type, location, size, density, orientation, and destruct time

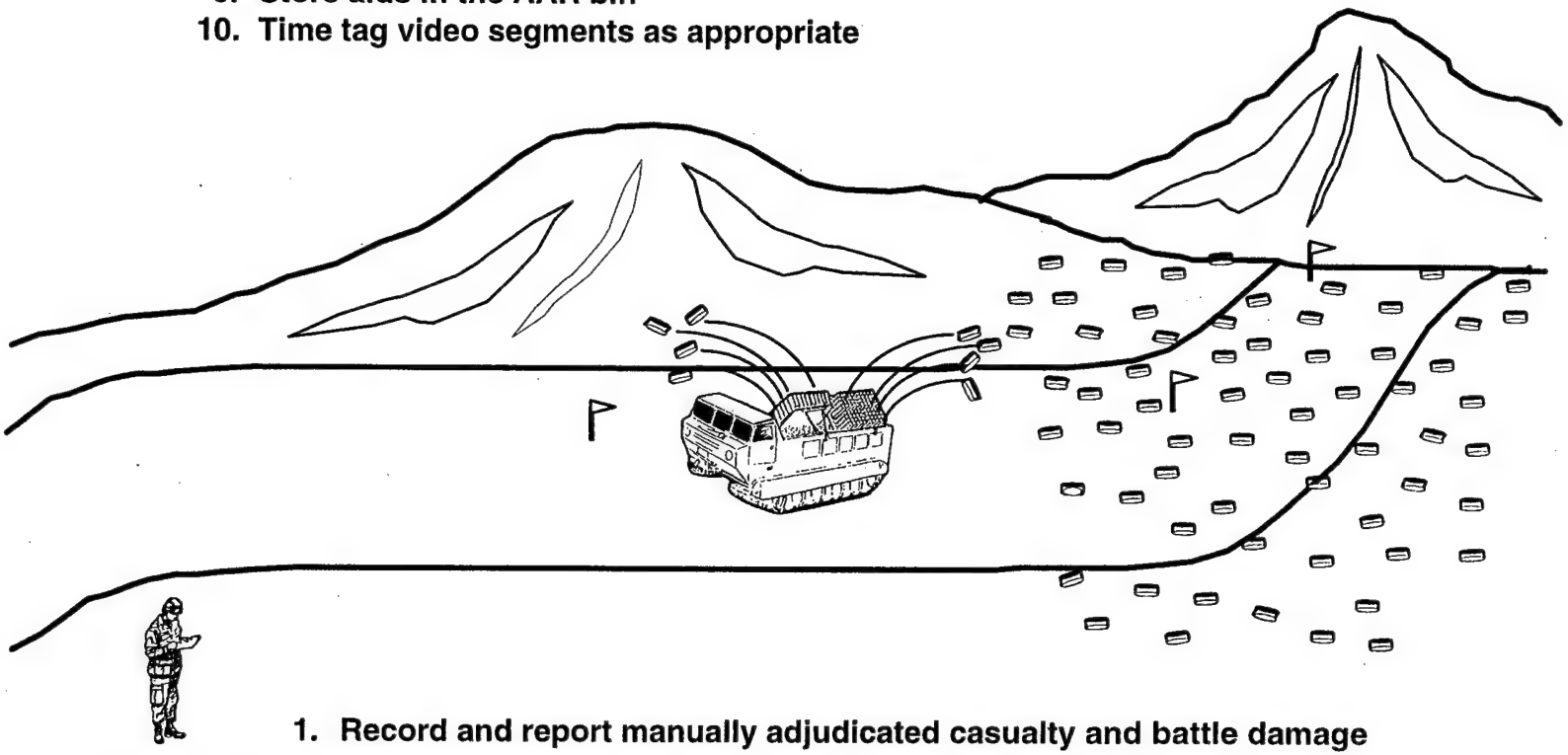
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Volcano Mine System (Ground Emplaced)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

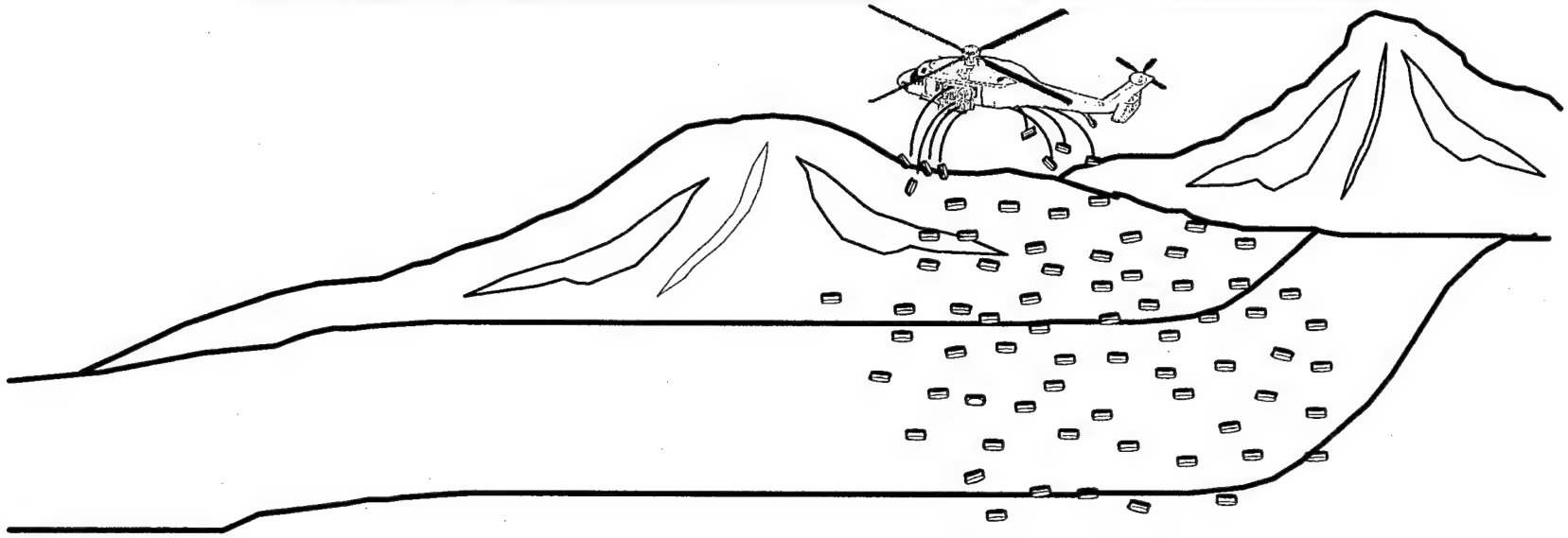
1. Record engagement information from OC
2. Plot minefield affected area on TAF workstation
3. Scale/zoom the map to display the engagement
4. Identify and display appropriate BLUFOR control measures
5. Prepare a top down view AAR aid of engagement
6. Title the AAR aid to provide context and significance
7. Prepare statistical chart showing minefield engagement results
8. Title the chart to provide context and significance
9. Store aids in the AAR bin
10. Time tag video segments as appropriate



ENGR OC

1. Record and report manually adjudicated casualty and battle damage assessments

Intrinsic Feedback: Volcano Mine System (Air Emplaced)



OPFOR FEEDBACK

- O - Visual means to identify mine locations
- Visual/audible indication of mine effects:
  - O - Fully operational
  - O - Catastrophic kill
  - O - Firepower kill
  - O - Mobility kill
  - O - Communications kill
  - P - Type combat damage
- O - Visual/audible indication of mines exploding

BLUFOR FEEDBACK

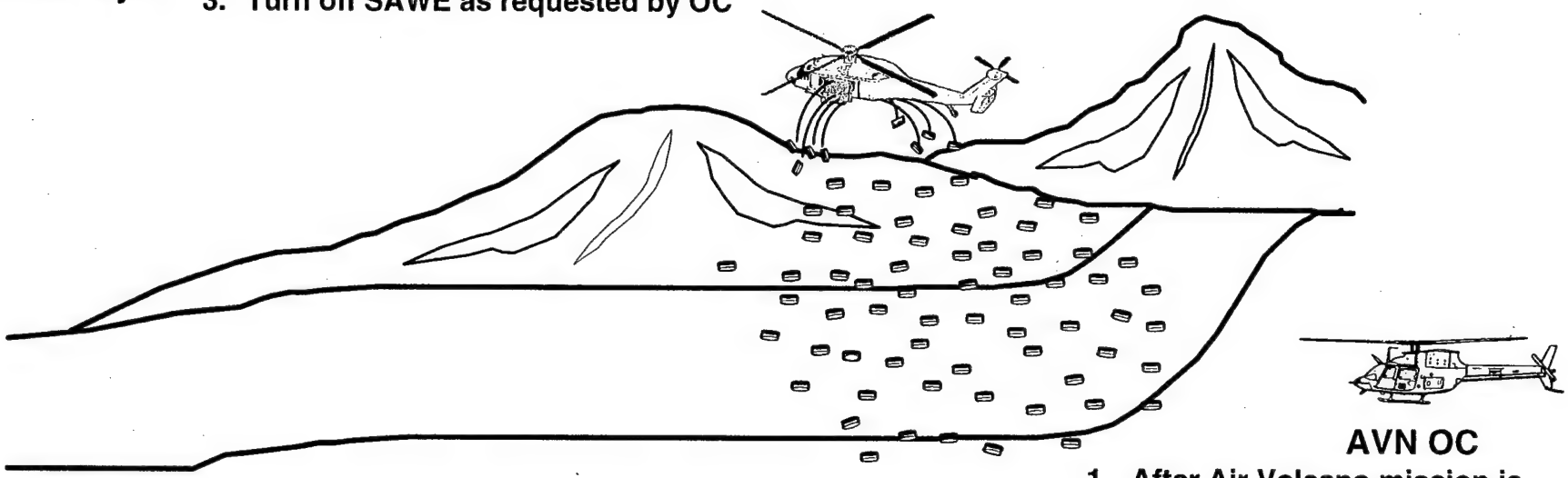
- Visual indication of mine effects:
  - P - Fully operational
  - P - Catastrophic kill
  - P - Firepower kill
  - P - Mobility kill
  - P - Combat effective
  - P - Out of action
- O - Visual indication of mines exploding
- N - Player capability to employ actual Volcano equipment

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Volcano Mine System (Air Emplaced)

TAF Analyst

1. Receive minefield location from OC and enter into TAF workstation
2. Verify minefield location (OC uses PDD to mark each corner of the minefield. TAF analyst confirms that SAWE minefield displayed on TAF computer coincides with area marked by ENGR OC)
3. Turn off SAWE as requested by OC



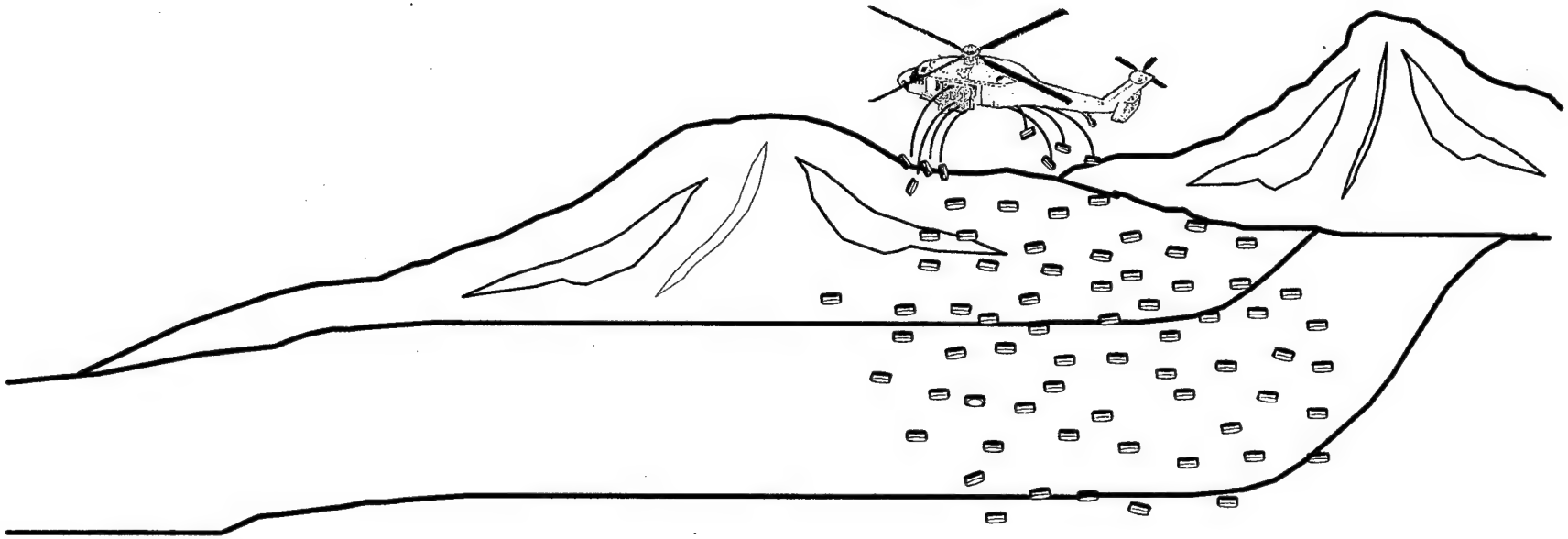
AVN OC

1. After Air Volcano mission is flown, provide ENGR OC start point and end point for minefield

ENGR OC

1. Receive air Volcano minefield start point and endpoint from AVN OC
2. Determine minefield size and location and inform TAF analyst
3. Confirm minefield location with TAF using PDD
4. Mark each corner of minefield with striped barber poles
5. Mark mine detonations with simulators when required
6. Manually adjudicate breaching actions and verify SAWE damage assessments

Extrinsic Feedback: Volcano Mine System (Air Emplaced)



OPFOR FEEDBACK

- O - Victim ID
- O - Victim location
- Victim status:
  - O - Fully operational
  - O - Catastrophic kill
  - O - Firepower kill
  - O - Mobility kill
  - O - Communications kill
  - O - Combat effective
  - O - Out of action
  - O - WIA (Type wounds)
  - O - KIA
  - O - Type combat damage
- O - Kill code

BLUFOR FEEDBACK

- O - Minefield type, location, size, density, orientation, and destruct time

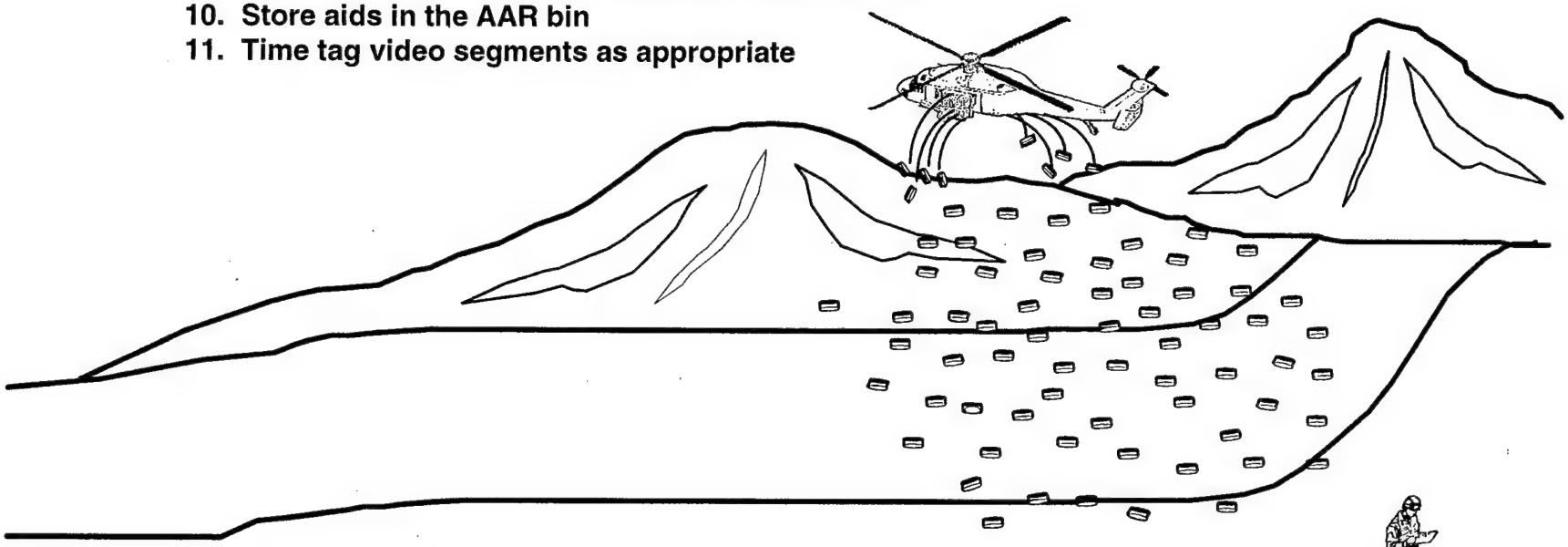
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Volcano Mine System (Air Emplaced)

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

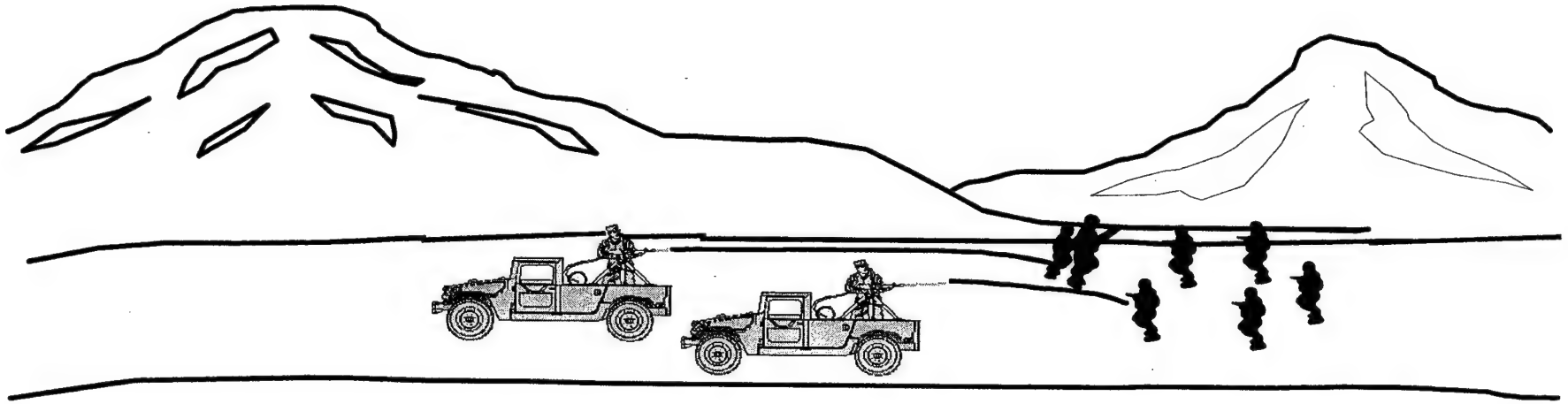
1. Record engagement information from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical chart showing minefield engagement results
9. Title the chart to provide context and significance
10. Store aids in the AAR bin
11. Time tag video segments as appropriate



1. Record and report victim ID and location for manual casualty and battle damage assessments
2. Obtain and record "kill codes" for OPFOR victims

ENGR OC

Intrinsic Feedback: Electric Water Cannon



P - Visual means to ID friendly and antagonists
P - Feedback from operation of the weapon
Visual/audible indication of weapon effects:
- P - Combat Effective
- P - Out of action

N - Location of impacting ordnance (other than direct hits)

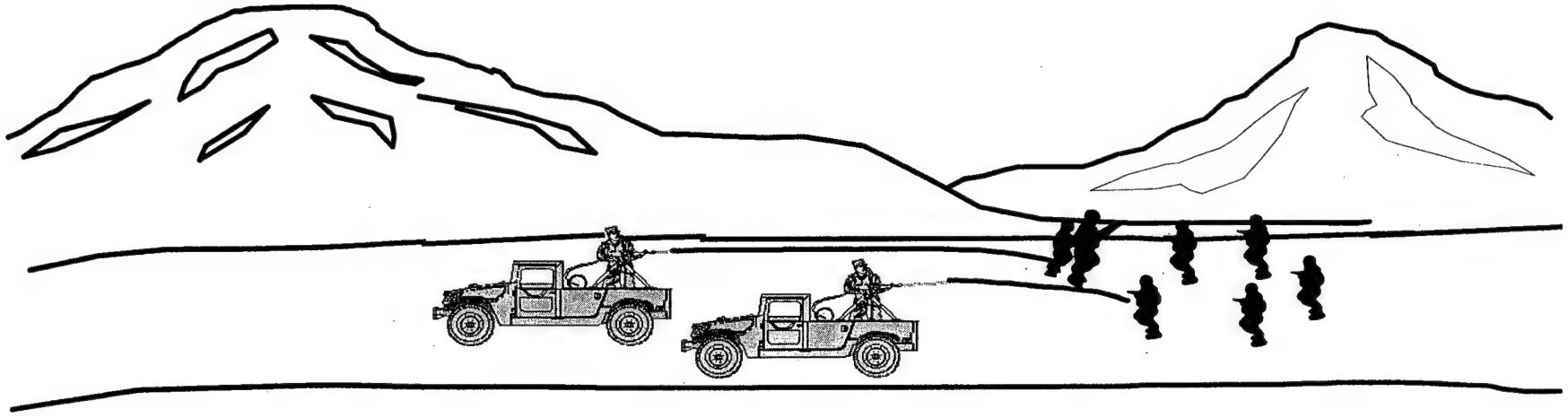
T - Visual signature when weapon fires
T - Audible indication of impacting ordnance (direct hits only)
T - Audible indication of Near Miss
T - Out of action for MILES engagements
O - Out of action for control gun assessments

Audible indication of weapon effects:
- T - Combat Effective
- T - Out of Action
- P - WIA (Type Wounds)

N - Visual/audible indication of impacting ordnance (other than direct hits)

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

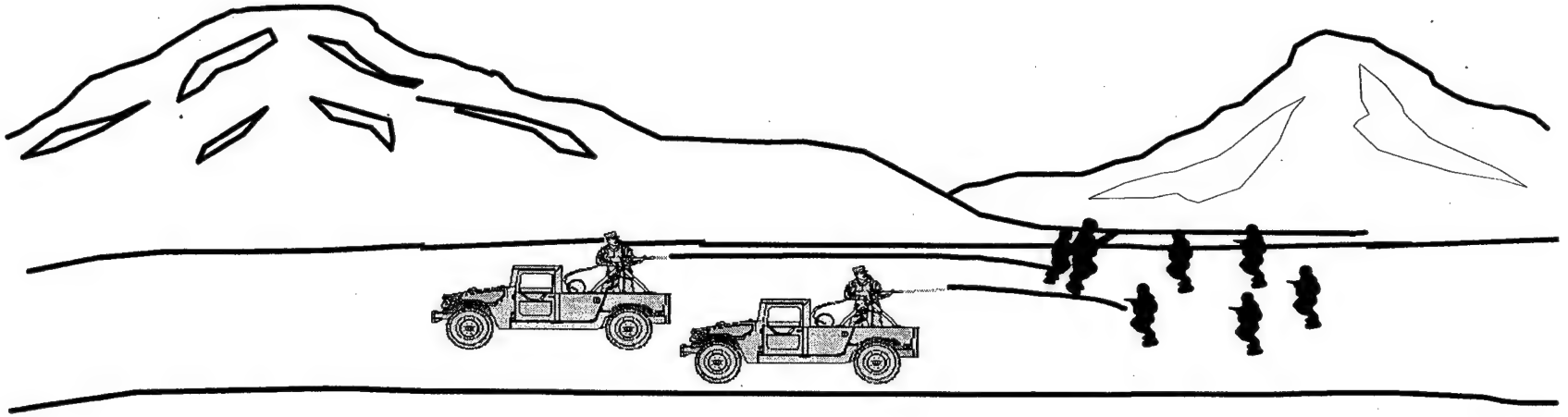
Intrinsic Feedback Functions: Electric Water Cannon



OC

1. Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

Extrinsic Feedback: Electric Water Cannon



I - Shooter ID
I - Shooter location
O - Pairing of shooter to victim for control gun assessments
N - Pairing of shooter to victim for MILES engagements

O - Victim ID
O - Victim location
Victim status:
- O - Combat Effective
- O - Out of Action
- O - WIA (Type Wounds)

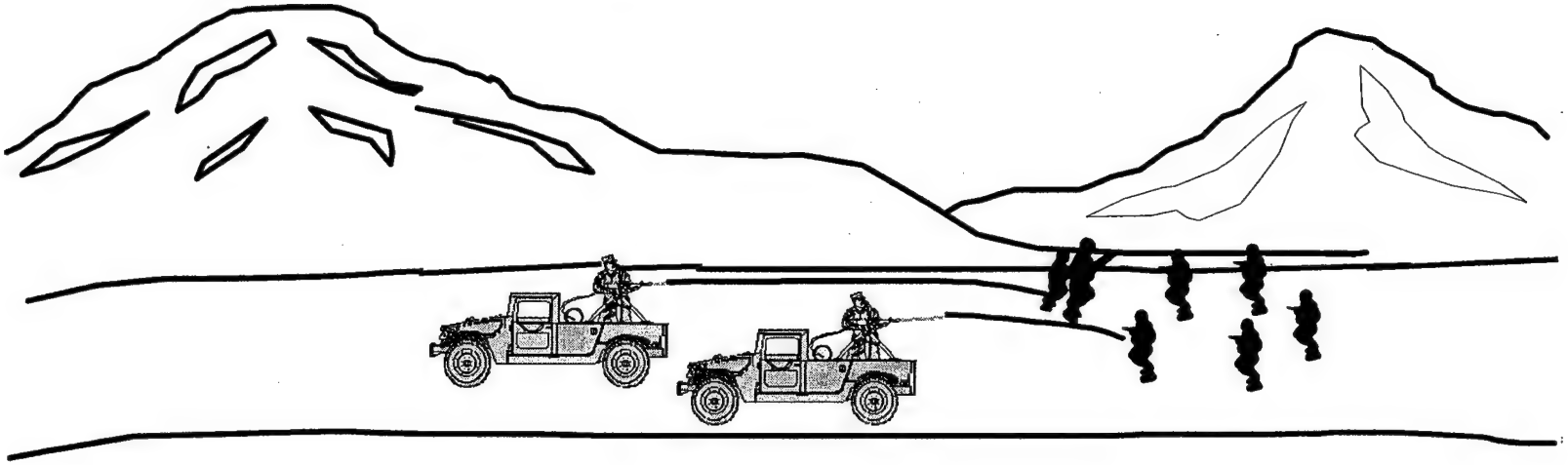
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Electric Water Cannon

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

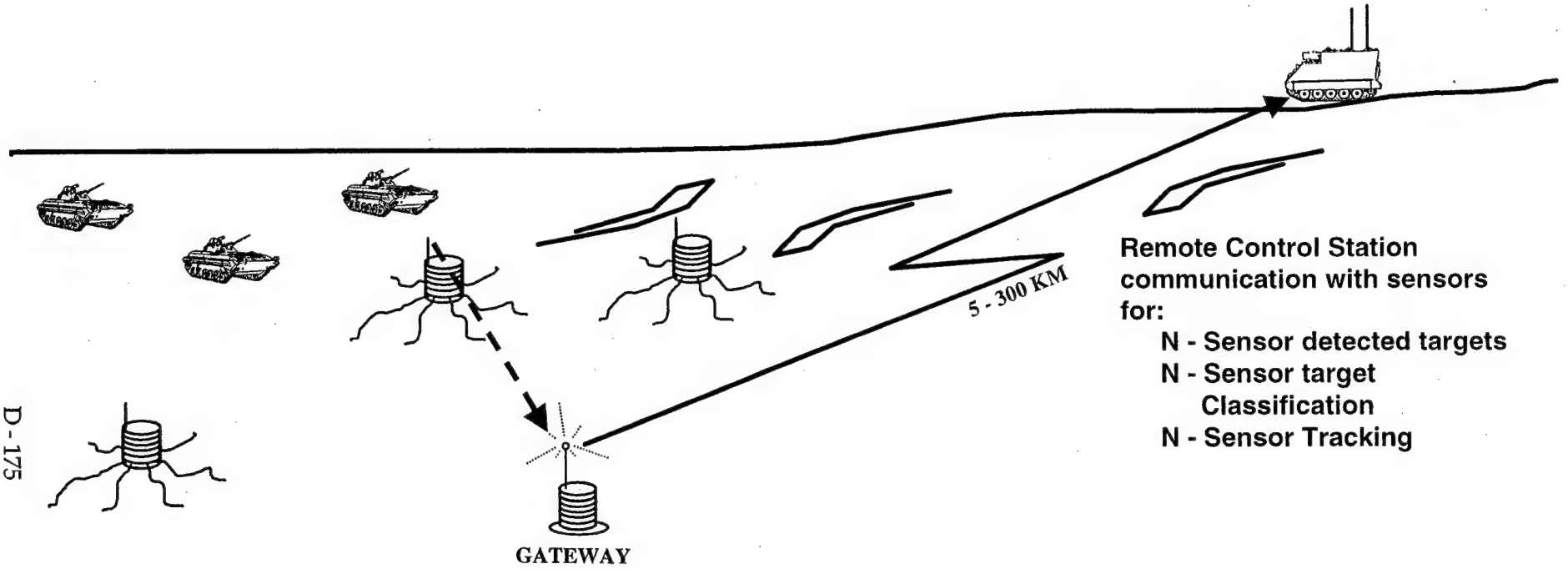
1. Record engagement information received from OC
2. Locate required weapon engagement in exercise history
3. Pan the map to the engagement area
4. Scale/zoom the map to display the engagement
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top down view AAR aid of the engagement
7. Title the AAR aid to provide context and significance
8. Prepare statistical shooter-victim charts from OPFOR and BLUFOR perspectives
9. Title the chart to provide context and significance
10. Store aids in AAR bin
11. Time tag video segments as appropriate



OC

1. Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, and WIA type wounds)
2. Record and report shooter ID and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

Intrinsic Feedback: Integrated Acoustic System



Remote Control Station communication with sensors for:

- N - Sensor detected targets
- N - Sensor target Classification
- N - Sensor Tracking

O - Indication of targets within acoustic range
Indication of targets:

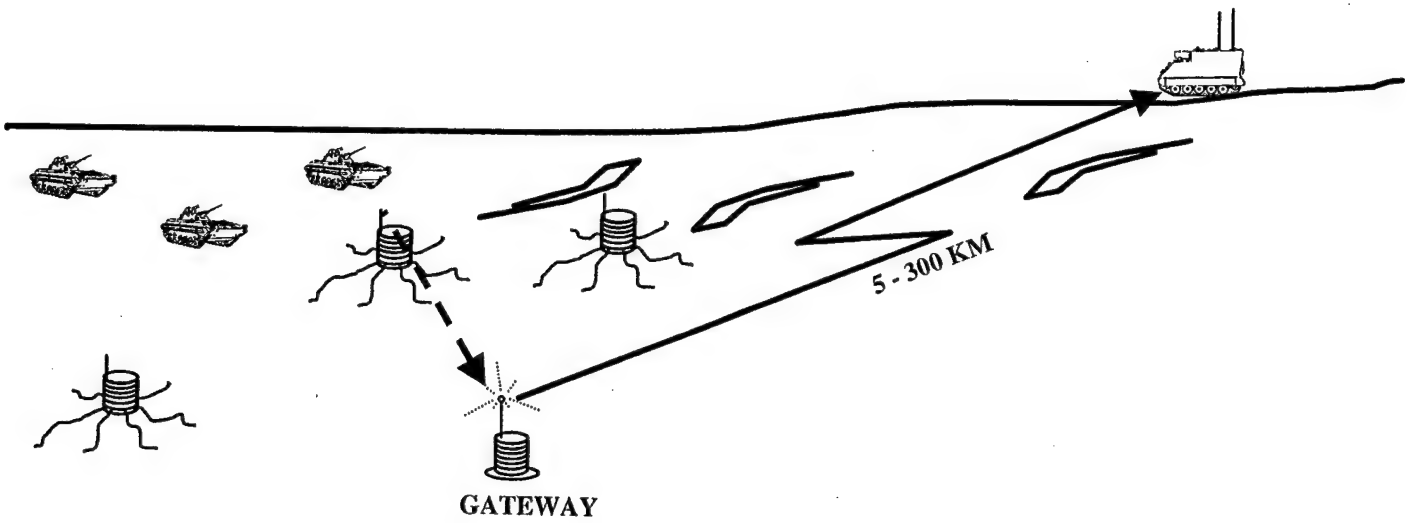
- O - Classification
- O - Location
- O - Direction
- O - Movement

N = No Feedback
T = TES Feedback
O = OC/TAF Feedback
P = Player Hands-On Feedback

Intrinsic Feedback Functions: Integrated Acoustic System

TAF Analyst

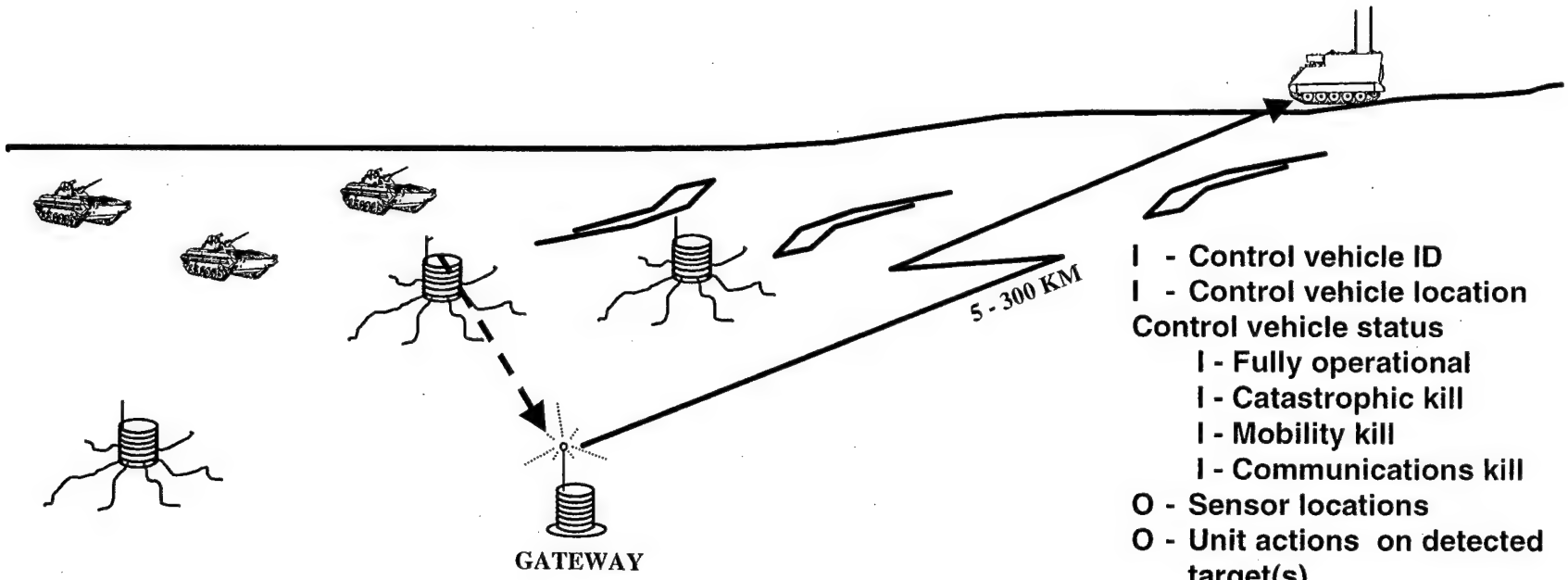
1. Receive sensor location information from OC
2. Assign a number to each sensor and gateway used, enter locations into TAF workstation
3. As vehicles or personnel approach range detection capability of sensors inform OC



OC

1. Monitor emplacement of acoustic sensors and record grid location of each sensor and gateway location and inform TAF analyst
2. When notified by TAF (or visually observe) that vehicles or personnel are approaching sensor detection range, verify vehicle/personnel location and inform remote control station of type vehicles or personnel, location, and direction of movement

Extrinsic Feedback: Integrated Acoustic System



I - Control vehicle ID
I - Control vehicle location
Control vehicle status
- I - Fully operational
- I - Catastrophic kill
- I - Mobility kill
- I - Communications kill

O - Sensor locations
O - Unit actions on detected target(s)
N - Sensor detected targets
N - Sensor classification
N - Sensor tracking

O - Detected target(s) ID
O - Detected target(s) location
O - Detected targets reported to remote control station

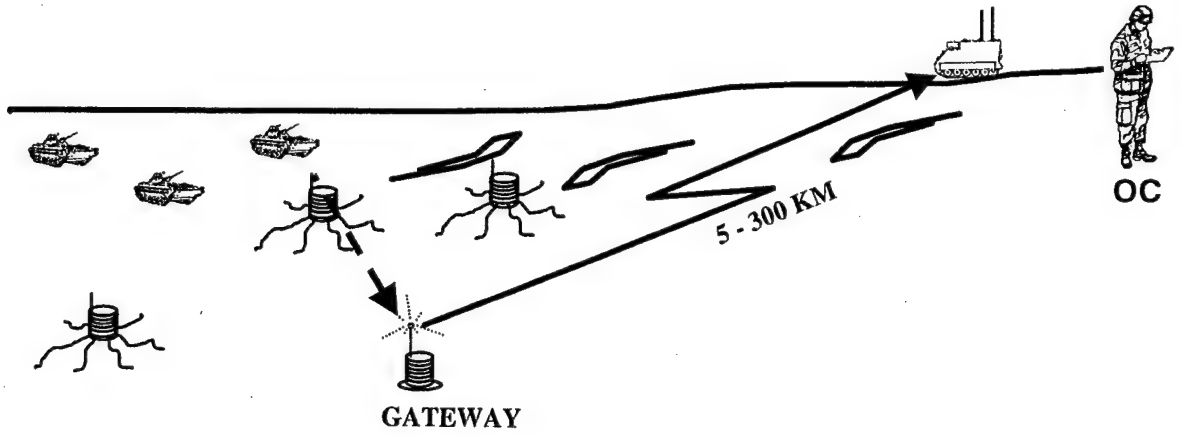
N = No Feedback
I = Instrumented Feedback
O = OC/TAF Feedback

Extrinsic Feedback Functions: Integrated Acoustic System

OC and TAF analysts intrinsic/control functions which supported the collection of extrinsic data are not repeated. Unique functions required to provide extrinsic feedback are listed below:

TAF Analyst

1. Record information on system-acquired targets from OC
2. Locate system acquisitions in exercise history
3. Pan the map to the acquisition area
4. Scale/zoom the map to display the acquisition
5. Identify and display appropriate BLUFOR control measures
6. Prepare a top-down view AAR aid of the acquisition(s)
7. Title the AAR aid to provide context and significance
8. Prepare statistical charts to show target(s) detected and BLUFOR actions
9. Title the chart to provide context and significance
10. Store aids in AAR bin



OC

1. Record and report unit actions with detected target(s) received

OC

1. Record and report detected target(s) ID, type, and location
2. Record and report total number of target(s) relayed to remote control station

APPENDIX E - ATESC Database Scores for Weapons and RSTA Systems

Tactical Engagement Simulation Concepts Introduction E-2

Concept: Implement Are Fire Projection E-4

Concept: Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements E-17

Concept: Pair Shooter to Victim E-34

Concept: Automate Mine/Sensor Effects E-48

Concept: Field and upgrade Light Weight PDD E-64

Concept: Automate NBC/Smoke Effects E-75

Concept: Instrument Unmanned Aerial Vehicle (UAV) and interface the Ground Control Station with the IS E-85

Concept: Pair Shooter to Misses E-92

Concept: Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation E-99

Concept: Automate RSTA Systems Detection Information E-107

Concept: Provide Tactile Feedback to Support Non-Lethal Engagements E-114

Concept: Automate Stimulation of Counterfire Radars E-121

Concept: Provide Virtual Simulation of Artillery and Mortar Effects E-126

Concept: Apply Embedded Simulation to Mounted Direct-Fire Point Target Engagements E-138

Introduction

Tactical Engagement Simulation Concepts

This appendix contains all concept reports generated from the Weapons Database. The reports contain all individual documentation for each concept. The concepts in the appendix are rank ordered as shown in Figure 26 Prioritization of Concepts considering Technology Limitations. This appendix organizes the concepts into four main sections:

(1) The Complete Concept Scores Section. This is the first page of each concept section and shows the overall scores the concept received in the following areas:

- Concept Function Score
- Unattainable Feedback Score
- Concept Systems Score
- TOTAL Concept Score

(2) The Associated Feedback Elements for Concept Section. This portion of each concept section identifies feedback elements associated with the concept. The section also indicates if the feedback is intrinsic or extrinsic. There is no score associated with feedback elements so this portion of the concept section has no score.

(3) The Functions Associated with Concept Section. This portion of the concept section shows each function required to support the feedback elements associated with the concept. In this portion you will also see if the function is intrinsic or extrinsic and what trainer performs the task (OC, TAF Analyst, Firemarker). The function score is in this section and you can see it has a range (high, medium , or low). This range shows where the score fell in the overall scoring of functions (upper 1/3 is high, middle 1/3 is medium and lower 1/3 is low). All individual function scores combine to make the Total Function Score, which shown on the first page of this portion.

(4) The Associated Unattainable Feedback Elements for Concept Section. This portion of the concept section identifies each unattainable feedback element associated with the concept. This portion of the concept section also identifies if the feedback is intrinsic or extrinsic. There are now scores shown for unattainable feedback because it is given the same score of 68 for each feedback item, however these scores are combined and the Unattainable Feedback Score is shown on the first page of this portion.

(5) The Systems Associated with Concept Section. In this portion of the concept section, we see the systems associated with the concept identified by BOS and its fielding value score. Table 2 of the basic report explains the fielding values for systems. The higher the fielding value the closer the system is to being fielded. The combined total of the fielding value scores makes up the Concept System Score. The concept system score is on the first page of this portion of the section.

Regardless of the total number of pages in each section shown above for the concept, the organization of the sections is the same. See Figure E-1 for an illustration of how each concept section is organized.

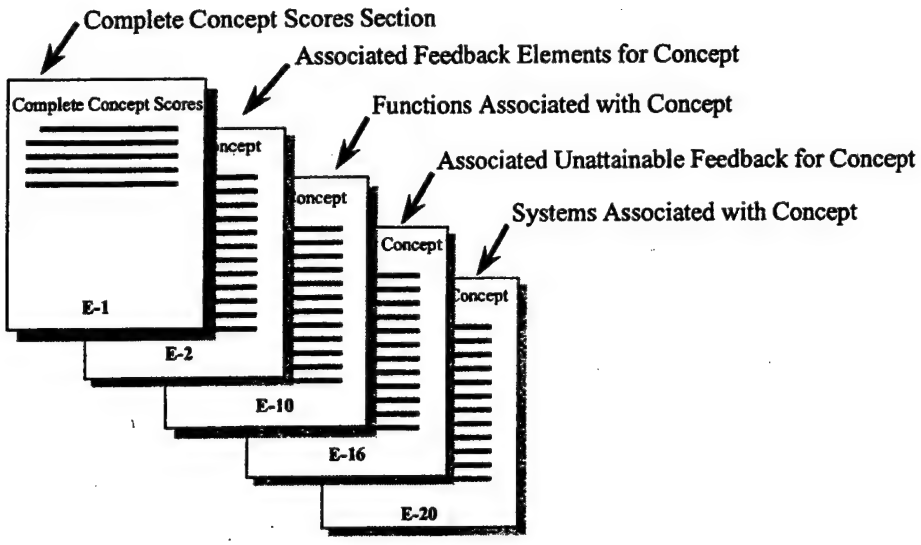


Figure E-1. Organization of Appendix E

Also included in Appendix E at page E - 153 is a chart that shows all systems analyzed and the concepts that apply to each system. See Figure E-2 for an illustration of the chart.

SYSTEM NAME	CONCEPT IN RECOMMENDED PRIORITY ORDER													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
105mm Terminally Guided Projectile TD														
12 Gauge Round (Rubber Ball) TD														
12-Gauge Round (Bean Bag) TD														
155mm Automated Howitzer (AH) TD														
155mm Howitzer, Dual Purpose Improved Conventional Munition (DPICM) Projectile														
155mm Howitzer, Field Artillery Scatterable Minefield (FASCAM) Projectile														
155mm Howitzer, M712 COPPERHEAD Projectile														
155mm Howitzer, Search and Destroy Armor (SADARM) Projectile														
2.75 inch Anti-Air TD														
Abrams Tank, M2 .50 Cal Machine Gun														
Abrams Tank, M240 7.62 Cal Coaxial Machine Gun														
Abrams Tank, Main Gun														
Advanced Extended Range Cargo Projectile (AERCAP) TD														
Advanced Manportable Sensors for the Dismounted Warrior														
Aerial Scout Sensor Integration TD														
AH-64D Longbow Apache Helicopter, HELLFIRE Missile														
Air/Land Enhanced Reconnaissance and Targeting (ALERT) ATD														
Anti-Personnel Mine M14														
Anti-Personnel Mine M16A1														
Anti-Tank Mine M21														

1 = Implement Area Fire Projection
2 = Apply Embedded Simulation (ES) to NLOS Engagements
3 = Pair Shooter to Victim
4 = Automate Mine/Sensor Effects
5 = Field and Update Light Weight PDD
6 = Automate NBC/Smoke Effects
7 = Instrument UAVs and Interface Ground Control Station with IS
8 = Pair Shooter to Misses
9 = Automate EFOGM Simulation
10 = Automate RSTA Systems Detection Information
11 = Provide Tactile Feedback to Support Non-Lethal Engagements
12 = Automate Stimulation of Counterfire Radars
13 = Provide Virtual Simulation fo Artillery and Mortar Battlefield Effects
14 = Apply ES to Direct-Fire Systems for Point Target Engagements

Figure E-2. Systems to Concepts Chart

Overall Concept Scores

Concept

Implement Area Fire Projection

Concept Function Score:	1158	***This concept automates*** 20 ***of 228 total Functions or*** 8.77% .
Unattainable Feedback Score:	3536	***This concept provides*** 52 ***of 96 Unattainable Feedback elements or*** 54.17%
Concept System Score:	33	***This Concept affects*** 13 ***of 155 total Systems or*** 8.39% .
TOTAL Concept Score:	**4727**	

Associated Feedback Elements for Concept

Concept:
Implement Area Fire Projection

This concept automates 27 of 161 total Trainer Provided Feedback elements or 16.77% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Ammunition type and amount fired

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Ammunition type and amount on hand

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Audible indication of NEAR MISS

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Hit/Kill aspect angle

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Kill code

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Out of action for control gun assessments

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Pairing of shooter to victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Pairing of shooter to victim for control gun assessments

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Shooter location

Concept:

Implement Area Fire Projection

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Victim degree of degradation: - Combat effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Victim degree of degradation: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Victim degree of degradation: - WIA (Type wounds)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - Combat effective

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - KIA

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - Out of action

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - Type combat damage

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - WIA (Type wounds)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual indication of effects on antagonist: - Combat effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual indication of effects on antagonist: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of ordnance effects: - Fully operational

Concept:

Implement Area Fire Projection

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Weapon ranging capability

Functions Associated with Concept

Concept:

Implement Area Fire Projection

Concept Function Score 1158	*This concept automates* 20 *of* 228 *total Functions or* 8.77%.

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, and WIA type wounds)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 73 — *RANGE* HIGH

Function:

Resurrect WIA's after appropriate time based on type net used (sticky or stinging)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 69 — *RANGE* HIGH

Function:

Resurrect WIA's after incapacitation wears off

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 69 — *RANGE* HIGH

Function:

Use control gun to indicate NEAR MISS to victims as required

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 69 — *RANGE* HIGH

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, type wounds for WIA, and KIA)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 61 — *RANGE* HIGH

Function:

Execute control gun KILL to simulate WIA's (NON-LETHAL wounds) for antagonists within radius of net

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 60 — *RANGE* Medium

Function:

Coordinate with attacking soldier to determine intended victim(s) identification

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 59 — *RANGE* Medium

Concept:

Implement Area Fire Projection

Function:

Record and report number of WIA's incapacitated/resurrected

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 59	*RANGE* Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES, limitations, and close-in engagements)

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 59	*RANGE* Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 59	*RANGE* Medium

Function:

Obtain and record "kill codes" for OPFOR victims

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 57	*RANGE* Medium

Function:

Obtain and record "kill codes", Hit/Kill aspect angle, and type combat damage for BLUFOR victims

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 57	*RANGE* Medium

Function:

Record and report shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 57	*RANGE* Medium

Function:

Coordinate with fire marker on vehicle ID's and location of victims affected by smoke

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE* 55	*RANGE* Medium

Concept:

Implement Area Fire Projection

Function:

Resurrect WIA's as required based on self-aid and buddy-aid

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 55	*RANGE* Medium

Function:

Verify shooter amount and type ammunition on hand

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 54	*RANGE* Medium

Function:

Determine success of engagement based on radius of entanglement net and location of shooter and victim(s)

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 53	*RANGE* Medium

Function:

Record and report pairing of shooter to victim

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 47	*RANGE* Medium

Function:

Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 46	*RANGE* Medium

Function:

Report number of Avenger shots taken to TAF analyst

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 40	*RANGE* Medium

Associated Unattainable Feedback for Concept

Concept:
Implement Area Fire Projection

Unattainable Feedback Concept Score: 3536	*This concept provides* 52 *of 96 total Unattainable Feedback elements or* 54.17% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Ammunition type and amount on hand

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of NEAR MISS

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of ordnance effects: - C4I kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of ordnance effects: - Combat effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of ordnance effects: - KIA

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of ordnance effects: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Audible indication of ordnance effects: - WIA (Type wounds)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Hit/Kill aspect angle

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Kill Code

Concept:
Implement Area Fire Projection

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***
Location of impacting ordnance (direct hits only)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***
Location of impacting ordnance (other than direct hits)

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Location of shooter and victim when inter-visible and exposure time

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Pairing of shooter to victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Pairing of shooter to victim for MILES engagements

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Shooter location

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***
Type ordnance fired

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim status: - C4I kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim status: - Combat effective

Concept:
Implement Area Fire Projection

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - Communications kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - Firepower kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - Fully operational

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - KIA

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - Mobility kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - Out of action

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - Type combat damage

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Victim status: - WIA (Type wounds)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Visual indication of engagement footprint

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Visual indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Visual indication of ordnance effects: - Combat Effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Visual indication of ordnance effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Visual indication of ordnance effects: - Fully operational

Concept:

Implement Area Fire Projection

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual indication of ordnance effects: - Mobility kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual indication of ordnance effects: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Combat effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Communications kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - K IA

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Type combat damage

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - WIA (Type wounds)

Concept:

Implement Area Fire Projection

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Weapon ranging capability

Systems Associated with Concept

Concept:

Implement Area Fire Projection

Concept System Score: 33 ***This concept affects*** 13 ***of 155 total Systems or*** 8.39% .

BOS	***System***	***Fielding Value***
MVR	Electric Vehicle Stopper TD	3
MVR	Non-Lethal Marker Munition TD	3
MVR	Non-Lethal Entanglement TD	3
MVR	MK-19 40mm Grenade Machine Gun	3
MVR	M203 Grenade Launcher	3
MVR	M18A1, Claymore Mine	3
MVR	Land Warrior System	3
MVR	HYDRA-70 Rocket System	3
MVR	Objective Sniper Weapon	2
MVR	Advanced Manportable Sensors for the Dismounted Warrior	2
MVR	Objective Individual Combat Weapon (OICW)	2
MVR	Objective Crew Served Weapon (OCSW)	2
MVR	Objective Personal Weapon	1

Overall Concept Scores

Concept

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Concept Function Score:	2148	***This concept automates 46 of 228 total Functions or 20.18%.***
Unattainable Feedback Score:	2448	***This concept provides 36 of 96 Unattainable Feedback elements or 37.50%***
Concept System Score:	78	***This Concept affects 31 of 155 total Systems or 20.00%***
TOTAL Concept Score:	**4674**	

Associated Feedback Elements for Concept

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

This concept automates 39 of 161 total Trainer Provided Feedback elements or 24.22% .

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Administrative resurrection due to TES limitations

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Ammunition type and amount fired

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Ammunition type and amount on hand

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Data in Call for Fire

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Go/No Go on FDC procedures

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Go/No Go on FO/COLT procedures

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Go/No Go on gun section procedures

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Graphical depiction of engagement footprint

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Hit/Kill aspect angle

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Kill code

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Location of impacting ordnance (may not be timely)

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

---

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Observer ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Observer location

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Out of action for control gun assessments

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Pairing of shooter to victim for control gun assessments

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target location data sent

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Communications kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Firepower kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Fully operational

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Victim status: - Mobility kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Victim status: - Type combat damage

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual indication of ordnance effects: - Firepower kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual indication of ordnance location

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual/audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual/audible indication of impacting ordnance (may not be timely)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual/audible indication of ordnance effects: - Communications kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual/audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Visual/audible indication of ordnance effects: - Fully operational

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Type combat damage

Functions Associated with Concept

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Concept Function Score 2148	*This concept automates* 46 *of 228 total Functions or* 20.18%.

Function:

Direct TAF to "turn off" SAWE and manually assess minefield effects during breaching operations

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 85 *RANGE* HIGH

Function:

Confirm minefield location with TAF using PDD

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 68 *RANGE* HIGH

Function:

Verify minefield location (OC uses PDD to mark each corner of the minefield. TAF analyst confirms that SAWE minefield displayed on TAF computer coincides with area marked by ENGR OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 67 *RANGE* HIGH

Function:

If FDC and Gun section procedures valid when LAST Round of FASCAM is fired, tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 66 *RANGE* HIGH

Function:

Confirm minefield is in correct location with the ENGR OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 65 *RANGE* HIGH

Function:

Receive engagement results from TAF analyst, if non-instrumented or non-tracking targets were properly engaged, direct OC closest to target location to administratively kill vehicle

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 65 *RANGE* HIGH

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

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Function:

For FASCAM, mark each of four corners with flagged barber poles

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 63 *RANGE* HIGH

Function:

Record and report Observer ID, location, and target location sent to shooter

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 62 *RANGE* HIGH

Function:

Manually adjudicate battle damage and casualties for MILES/AGES II limitations (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 60 *RANGE* Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 59 *RANGE* Medium

Function:

Obtain and record "kill codes" for OPFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Record and report shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

If FDC and Gun section procedures valid when LAST Round of SADARM is fired, tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Function:

Obtain and record "kill codes" and type combat damage for BLUFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Assess Call for Fire and Laser designation procedures

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Monitor Fire Mission Data, and BN FDC procedures

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 51 *RANGE* Medium

Function:

If ammunition on hand and Gun section procedures valid inform FDC OC

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 50 *RANGE* Medium

Function:

If FDC and Gun section procedures valid tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 50 *RANGE* Medium

Function:

Allow SAWE to assess target(s) in search footprint for 8-10 seconds, when search time has elapsed, turn off SAWE footprint

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 48 *RANGE* Medium

Function:

If fires are smoke or illumination missions, locate the nearest fire marker to mark fires

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 47 *RANGE* Medium

Function:

If FO/COLT, FDC, and Gun section procedures valid tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

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Function:

If fires fall on OPFOR notify nearest firemarker to mark location of impacting ordnance

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

If fires fall within 1,000 meters of BLUFOR forces, notify OC to mark location of impacting ordnance

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

Record instrumented battle damage and OC manual assessments as required

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

Upon seeing FLASHWESS from AH-64D, OC coordinates with crew to determine target locations engaged and type ammunition fired

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

When number of vehicles killed exceeds number of missiles fired, resurrect vehicles accordingly from TAF

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

Coordinate with FO/COLT OC on validity of FO procedures

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					44	Medium

Function:

If procedures valid call TAF to notify OC closest to victim(s), and tell them to administratively kill vehicle(s) depending on number of rounds fired

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					44	Medium

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Function:

Monitor observer Call for Fire procedures

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					44	Medium

Function:

Record and report OC assessed OPFOR kills

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					44	Medium

Function:

Receive Fire Mission Data, from FDC personnel, forward target location for TAF analyst to enter into TAF work station

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					39	Medium

Function:

If fires are beyond 1,000 meters from BLUFOR, notify nearest firemarker to mark location of impacting ordnance

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					36	low

Function:

Receive fire mission data from FDC OC and enter it into TAF work station

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					36	low

Function:

When directed by the OC fire the mission to provide graphical description of engagement footprint

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					36	low

Function:

Upon request of FO/COLT OC, notify OC closest to victim(s) and direct them to administratively kill player entities

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					34	low

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

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Function:

Enter four corners and center grid location of FASCAM minefield in TAF computer for SAWE assessment

☑ Intrinsic	☐ Extrinsic	☐ OC	☑ TAF Analys	☐ Firemarker	SCORE	RANGE
					33	low

Function:

IF an OC is unable to kill the player entities, administratively kill player unit(s) from the TAF

☑ Intrinsic	☐ Extrinsic	☐ OC	☑ TAF Analys	☐ Firemarker	SCORE	RANGE
					33	low

Function:

Inform OC of other engagements being conducted, that need observation as required

☑ Intrinsic	☐ Extrinsic	☐ OC	☑ TAF Analys	☐ Firemarker	SCORE	RANGE
					33	low

Function:

Coordinate with Battery FDC OC and PLT OC on mission procedures if required

☑ Intrinsic	☐ Extrinsic	☑ OC	☐ TAF Analys	☐ Firemarker	SCORE	RANGE
					31	low

Function:

Mark minefield with yellow smoke when vehicles are within 100 meters of minefield

☑ Intrinsic	☐ Extrinsic	☑ OC	☐ TAF Analys	☐ Firemarker	SCORE	RANGE
					31	low

Function:

As emplacing markers for FASCAM mark actions with yellow smoke

☑ Intrinsic	☐ Extrinsic	☐ OC	☐ TAF Analys	☑ Firemarker	SCORE	RANGE
					30	low

Function:

Enter SADARM ordnance search footprint (400 x 400 meters) as a FASCAM minefield in the TAF work station for SAWE assessment

☑ Intrinsic	☐ Extrinsic	☐ OC	☑ TAF Analys	☐ Firemarker	SCORE	RANGE
					30	low

Function:

Notify closest firemarker to mark fires for target(s) in search footprint

☑ Intrinsic	☐ Extrinsic	☐ OC	☑ TAF Analys	☐ Firemarker	SCORE	RANGE
					30	low

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Function:

Notify closest firemarker to mark minefield

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					29	low

Function:

Turn off SAWE as requested by OC

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					29	low

Function:

Observe CIS assessment of engagement on top down display, report results to OC

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					28	low

Associated Unattainable Feedback for Concept

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Unattainable Feedback Concept Score: 2448	*This concept provides* 36 *of 96 total Unattainable Feedback elements or* 37.50% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Ammunition type and amount on hand

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Audible signature when weapon fires

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Hit/Kill aspect angle

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Kill Code

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Laser designation procedures

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Location of impacting ordnance (direct hits only)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Location of impacting ordnance (other than direct hits)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Location of shooter and victim when inter-visible and exposure time

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Observer ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Observer location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Pairing of shooter to MISSES

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Pairing of shooter to victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Pairing of shooter to victim for MILES engagements

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Communications kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Firepower kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Fully operational

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Mobility kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Type combat damage

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of engagement footprint

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Firepower kill

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual indication of ordnance effects: - Fully operational

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual indication of ordnance effects: - Mobility kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of impacting ordnance (other than direct hits)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of NEAR MISS

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Communications kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Type combat damage

Systems Associated with Concept

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

Concept System Score: 78 ***This concept affects 31 of 155 total Systems or 20.00%.***

BOS	*System*	*Fielding Value*
FS	M198, M102, M119, Towed Howitzers	3
FS	Self-Propelled Howitzers M109A1, A2, A3, A4, A5	3
FS	Rocket Assisted Projectile (RAP)	3
FS	155mm Howitzer, Dual Purpose Improved Conventional Munition (DPICM) Projectile	3
FS	Paladin Howitzer	3
FS	Multiple Launch Rocket System (MLRS)	3
FS	155mm Howitzer, Field Artillery Scatterable Minefield (FASCAM) Projectile	3
FS	105mm Terminally Guided Projectile TD	3
FS	Autonomous Intelligent Submunition (AIS) TD	3
FS	155mm Howitzer, Search and Destroy Armor (SADARM) Projectile	3
FS	155mm Howitzer, M712 COPPERHEAD Projectile	3
MVR	Apache AH-64A Helicopter, HELLFIRE Missile	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, HELLFIRE II Missile	3
MVR	AH-64D Longbow Apache Helicopter, HELLFIRE Missile	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE	3
MVR	Longbow Apache AH-64D Helicopter LONGBOW HELLFIRE Missile	3
MVR	RAH-66 Comanche LONGBOW HELLFIRE Missile	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE II	3
FS	Advanced Extended Range Cargo Projectile (AERCAP) TD	2
FS	High Mobility Artillery Rocket System (HIMARS) TD	2
FS	155mm Automated Howitzer (AH) TD	2
FS	Brilliant Anti-Armor Submunition (BAT)	2
FS	Crusader Howitzer	2
FS	Guided Multiple Launch Rocket System (MLRS) ATD	2
FS	Indirect Precision Fire (IPF) ATD	2
FS	Precision Guided Mortar Munition (PGMM) ATD	2
MVR	Air/Land Enhanced Reconnaissance and Targeting (ALERT) ATD	2
MVR	Tank Extended Range Munition (TERM) TD	2
MVR	Future missile Technology Integration (FMTI)	2

Concept:

Apply Embedded Simulation to Non-Line of Sight (NLOS) Engagements

FS	Target Defeat Capability TD	1
MVR	Brilliant Helicopter Advanced Weapons (BHAW) TD	1

Overall Concept Scores

Concept

Pair Shooter to Victim

Concept Function Score:	1627	***This concept automates*** 31 ***of 228 total Functions or*** 13.60%.
Unattainable Feedback Score:	1700	***This concept provides*** 25 ***of 96 Unattainable Feedback elements or*** 26.04%
Concept System Score:	169	***This Concept affects*** 66 ***of 155 total Systems or*** 42.58%.
TOTAL Concept Score:	**3496**	

Associated Feedback Elements for Concept

Concept:
Pair Shooter to Victim

This concept automates 29 of 161 total Trainer Provided Feedback elements or 18.01% .

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Administrative resurrection due to TES limitations

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Ammunition type and amount on hand

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Audible indication of impacting ordnance (direct hits only)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Hit/Kill aspect angle

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Kill code

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Pairing of shooter to victim

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Pairing of shooter to victim for control gun assessments

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Shooter ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Shooter location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Vector pairing of shooter to victim

Concept:

Pair Shooter to Victim

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Victim degree of degradation: - Combat effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Victim degree of degradation: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Victim degree of degradation: - WIA (Type wounds)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Catastrophic kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Combat effective

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Fully operational

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - KIA

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Mobility kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Out of action

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Type combat damage

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - WIA (Type wounds)

Concept:

Pair Shooter to Victim

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Weapon ranging capability

Functions Associated with Concept

Concept:

Pair Shooter to Victim

Concept Function Score 1627	*This concept automates* 31 *of 228 total Functions or* 13.60%.

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, and WIA type wounds)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 73 — *RANGE* HIGH

Function:

Use control gun to indicate NEAR MISS to victims as required

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 69 — *RANGE* HIGH

Function:

Draw vector from Avenger to fixed wing aircraft

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* — *SCORE* 67 — *RANGE* HIGH

Function:

Receive engagement results from TAF analyst, if non-instrumented or non-tracking targets were properly engaged, direct OC closest to target location to administratively kill vehicle

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 65 — *RANGE* HIGH

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, type wounds for WIA, and KIA)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 61 — *RANGE* HIGH

Function:

Execute control gun KILL to simulate WIA's (NON-LETHAL wounds) for antagonists within radius of net

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 60 — *RANGE* Medium

Concept:

Pair Shooter to Victim

Function:

Coordinate with attacking soldier to determine intended victim(s) identification

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					59	Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES, limitations, and close-in engagements)

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					59	Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					59	Medium

Function:

Draw vector connecting shooter to victim

☐ *Intrinsic*	☑ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					57	Medium

Function:

Obtain and record "kill codes" for OPFOR victims

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					57	Medium

Function:

Obtain and record "kill codes", Hit/Kill aspect angle, and type combat damage for BLUFOR victims

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					57	Medium

Function:

Record and report victim ID and location of vehicles that are affected by smoke

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE*	*RANGE*
					57	Medium

Concept:

Pair Shooter to Victim

Function:

Coordinate with fire marker on vehicle ID's and location of victims affected by smoke

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* | *SCORE* 55 | *RANGE* Medium

Function:

Verify shooter amount and type ammunition on hand

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* | *SCORE* 54 | *RANGE* Medium

Function:

Assess vehicle(s) with control gun as directed by TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* | *SCORE* 53 | *RANGE* Medium

Function:

Determine success of engagement based on radius of entanglement net and location of shooter and victim(s)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* | *SCORE* 53 | *RANGE* Medium

Function:

Mark fires with smoke as directed by the TAF

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* | *SCORE* 53 | *RANGE* Medium

Function:

Navigate to location of impacting ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* | *SCORE* 52 | *RANGE* Medium

Function:

Record and report pairing of shooter to victim

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* | *SCORE* 47 | *RANGE* Medium

Function:

Administratively assess affected vehicle(s) with mobility kills from TAF

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* | *SCORE* 45 | *RANGE* Medium

Concept:

Pair Shooter to Victim

Function:

Compile total Avenger shots taken from all OC's and provide information to DTOC counterpart for casualty assessment

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

If affected vehicle(s) ID not visible on TAF work station, inform firemarker to assess vehicle as mobility kill

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, and MILES limitations)

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

When number of vehicles killed exceeds number of missiles fired, resurrect vehicles accordingly from TAF

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					45	Medium

Function:

OC notifies TAF of shooter ID, location, target location, type and amount ammunition fired

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					44	Medium

Function:

Receive location, volume and type ordnance to mark from TAF analyst

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE*	*RANGE*
					43	Medium

Function:

Locate nearest fire marker to mark mission with smoke to depict engagement

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					42	Medium

Concept:

Pair Shooter to Victim

Function:

Notify TAF analyst when fires marked

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE* 40	*RANGE* Medium

Function:

When casualty assessment complete inform appropriate OC of victim ID, location, and victim status for engagement results

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE* 37	*RANGE* Medium

Function:

Record and report Avenger ID and Location

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 29	*RANGE* low

Associated Unattainable Feedback for Concept

Concept:
Pair Shooter to Victim

Unattainable Feedback Concept Score: 1700	*This concept provides* 25 *of 96 total Unattainable Feedback elements or* 26.04% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Ammunition type and amount on hand

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Hit/Kill aspect angle

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Kill Code

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Location of impacting ordnance (direct hits only)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Pairing of shooter to MISSES

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Pairing of shooter to victim

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Pairing of shooter to victim for MILES engagements

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Shooter ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Shooter location

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*
Type ordnance fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*
Vector pairing of shooter to victim

Concept:

Pair Shooter to Victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - C4I kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Combat effective

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Communications kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Firepower kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Fully operational

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - KIA

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Mobility kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Out of action

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - WIA (Type wounds)

Systems Associated with Concept

Concept:

Pair Shooter to Victim

Concept System Score: 169 ***This concept affects 66 of 155 total Systems or 42.58%.***

BOS	*System*	*Fielding Value*
AD	Chaparral	3
AD	Linebacker	3
AD	Vulcan	3
AD	Stinger	3
AD	Avenger Air Defense System	3
AD	High Mobility Ground Launched AIM-120 Advanced Medium Range Air To Air Missile (AMRAAM) TD (HMGL-AMRAAM)	3
MS	Electric Water Cannon	3
MVR	Longbow Apache AH-64D Helicopter LONGBOW HELLFIRE Missile	3
MVR	Combustion Engine Defeat Mechanism TD	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE II	3
MVR	12 Gauge Round (Rubber Ball) TD	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE	3
MVR	Javelin, Anti-Tank Weapon	3
MVR	HYDRA-70 Rocket System	3
MVR	Direct Fire Lethality ATD	3
MVR	M136 Light Anti-Tank Weapon (AT4)	3
MVR	Battlefield Combat Identification System (BCIS)	3
MVR	Land Warrior System	3
MVR	Apache AH-64A Helicopter, HELLFIRE Missile	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, M230 30mm Chain Gun	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, HELLFIRE II Missile	3
MVR	AH-64D Longbow Apache Helicopter, HELLFIRE Missile	3
MVR	Abrams Tank, Main Gun	3
MVR	Abrams Tank, M240 7.62 Cal Coaxial Machine Gun	3
MVR	Abrams Tank, M2 .50 Cal Machine Gun	3
MVR	12-Gauge Round (Bean Bag) TD	3
MVR	Bradley Fighting Vehicle, 25mm Cannon	3
MVR	MK-19 40mm Grenade Machine Gun	3
MVR	Non-Lethal Marker Munition TD	3

Concept:

Pair Shooter to Victim

MVR	M16A2 Rifle	3
MVR	RAH-66 Comanche LONGBOW HELLFIRE Missile	3
MVR	Mid-Sized Riot Control Dispenser TD	3
MVR	Non-Lethal Entanglement TD	3
MVR	M830 High Explosive Anti-Tank Multipurpose (HEAT-MP-T) Round	3
MVR	M203 Grenade Launcher	3
MVR	M72 Light Anti-Tank Weapon	3
MVR	M18A1, Claymore Mine	3
MVR	M47 Medium Anti-Tank Weapon (DRAGON)	3
MVR	M249 Squad Automatic Weapon (SAW)	3
MVR	Electric Vehicle Stopper TD	3
MVR	Multi-Purpose Individual Munition/Short Range Anti-Tank Weapon (MPIM/SRAW) TD	3
MVR	M829A2 Armor Piercing, Fin Stabilized, Discarding Sabot, Tracer (APFSDS-T) Round	3
AD	Electronic Integrated Sensor Suite for Air Defense (EISS-AD) TD	2
AD	2.75 inch Anti-Air TD	2
MVR	Integrated Sight (IS) TD	2
MVR	RAH-66 Comanche 20mm Chain Gun	2
MVR	Objective Individual Combat Weapon (OICW)	2
MVR	Objective Sniper Weapon	2
MVR	Battlefield Combat Identification (BCID) ATD	2
MVR	Tank Extended Range Munition (TERM) TD	2
MVR	Future missile Technology Integration (FMTI)	2
MVR	Low-Cost Precision Kill (LCPK) (ATG/GTG) 2.75 inch Guided Rocket TD	2
MVR	Kinetic Energy Tungsten Core (KE-T) Round	2
MVR	Integrated Situational Awareness and Countermeasures (ISCAM) TD	2
MVR	Hit Avoidance ATD	2
MVR	Multispectral Countermeasures (MSCM) ATD	2
MVR	Ground Vehicle Distributed Defense TD	2
MVR	Objective Crew Served Weapon (OCSW)	2
MVR	Full Spectrum Threat Protection TD	2
MVR	Line of Sight Anti-Tank (LOSAT) ATD	2
MVR	Compact Kinetic Energy Missile TD	2
MVR	Future Infantry Fighting Vehicle (FIFV)	1
MVR	Future Combat System (FCS)	1

Concept:

Pair Shooter to Victim

MVR	Objective Personal Weapon	1
MVR	Brilliant Helicopter Advanced Weapons (BHAW) TD	1
MVR	Rotorcraft Air Combat Enhancement (RACE)	1

Overall Concept Scores

Concept

Automate Mine/Sensor Effects

Concept Function Score:	2686	*This concept automates* 56 *of 228 total Functions or* 24.56%.
Unattainable Feedback Score:	816	*This concept provides* 12 *of 96 Unattainable Feedback elements or* 12.50%
Concept System Score:	50	*This Concept affects* 19 *of 155 total Systems or* 12.26%
TOTAL Concept Score:	**3552**	

Associated Feedback Elements for Concept

Concept:
Automate Mine/Sensor Effects

This concept automates 47 of 161 total Trainer Provided Feedback elements or 29.19% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Detected target(s) ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Detected target(s) location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Detected targets reported to remote control station

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Indication of remote vehicle status: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Indication of remote vehicle status: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Indication of targets within acoustic range

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Indication of targets: - Classification

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Indication of targets: - Direction

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Indication of targets: - Location

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Indication of targets: - Movement

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Kill code

Concept:

Automate Mine/Sensor Effects

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Mine locations

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Mine locations, density, orientation, and type

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Minefield type, location, size, density, orientation, and destruct time

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Mines detonated by type

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Obstacle type, location, size, orientation, and destruct time (for minefields)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Planned remote vehicle route

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Radiating fans to mark remote vehicle range

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Remote Vehicle status: - Catastrophic kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Remote Vehicle status: - Fully operational

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Remote Vehicle status: - Mobility kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Remote Vehicle status: - Type combat damage

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Sensor locations

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Unit actions on detected target(s)

Concept:

Automate Mine/Sensor Effects

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Catastrophic kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Combat effective

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Communications kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Firepower kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Fully operational

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - KIA

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Mobility kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Out of action

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Type combat damage

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - WIA (Type wounds)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual indication of mines exploding

Concept:

Automate Mine/Sensor Effects

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual means to identify mine locations

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of mine effects: - Catastrophic kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of mine effects: - Communications kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of mine effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of mine effects: - Fully operational

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of mine effects: - Mobility kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of mine effects: - Type combat damage

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of mines exploding

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible signature of exploding dumb mines

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible signature of exploding smart mines (seismic, acoustic) from radiating signals

Functions Associated with Concept

Concept:

Automate Mine/Sensor Effects

Concept Function Score 2686	*This concept automates* 56 *of 228 total Functions or* 24.56%.

Function:

Monitor procedures used to emplace obstacle

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 79 *RANGE* HIGH

Function:

Confirm minefield location with TAF using PDD

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 68 *RANGE* HIGH

Function:

Manually adjudicate minefield effects for battle damage and casualties

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 68 *RANGE* HIGH

Function:

Manually assess minefield effects during breaching operations

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 68 *RANGE* HIGH

Function:

Monitor emplacement of minefield and record grid location of each mine and inform TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 68 *RANGE* HIGH

Function:

Manually adjudicate breaching actions and verify SAWE damage assessments

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 67 *RANGE* HIGH

Function:

Monitor procedures used to emplace minefield

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 67 *RANGE* HIGH

Concept:

Automate Mine/Sensor Effects

Function:

Record and report detected target(s) ID, type, and location

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 67 *RANGE* HIGH

Function:

Verify minefield location (OC uses PDD to mark each corner of the minefield. TAF analyst confirms that SAWE minefield displayed on TAF computer coincides with area marked by ENGR OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 67 *RANGE* HIGH

Function:

Confirm minefield is in correct location with the ENGR OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 65 *RANGE* HIGH

Function:

Monitor emplacement of acoustic sensors and record grid location of each sensor and gateway location and inform TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 59 *RANGE* Medium

Function:

Record and report victim ID and location for manual casualty and battle damage assessments

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 58 *RANGE* Medium

Function:

Obtain and record "kill codes" for OPFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Monitor remote vehicle movement with range of radiating signals visible on TAF work station, as remote vehicle approaches smart mines, direct firemarkers to mark mine detonation

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Concept:

Automate Mine/Sensor Effects

Function:

Record and report manually adjudicated casualty and battle damage assessments

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Obtain and record "kill codes" and type combat damage for BLUFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Record and report type combat damage for SAWE and manually adjudicated assessments

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Record and report victim ID, location, and type combat damage for non-instrumented vehicles

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Assign a number to each mine and enter mine locations into TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Assign a number to each sensor and gateway used, enter locations into TAF workstation

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Navigate to location of impacting ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 52 *RANGE* Medium

Function:

Manually assess ordnance effects on breaching vehicle (Fully operational, Catastrophic kill, Mobility kill, and Type combat damage)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 51 *RANGE* Medium

Concept:

Automate Mine/Sensor Effects

Function:

Mark each corner of minefield with striped barber poles

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 51 *RANGE* Medium

Function:

Record minefield type, location, size, orientation, and destruct time

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 50 *RANGE* Medium

Function:

Record and report total number of target(s) relayed to remote control station

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

Record and report unit actions with detected target(s) received

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

Receive mine location information from OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Receive minefield location from OC and enter into TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Receive sensor location information from OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Record instrumented battle damage and OC manual assessments as required

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Concept:

Automate Mine/Sensor Effects

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, and MILES limitations)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Determine minefield size and location and inform TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Function:

Record and report manual assessments for smart and dumb mine detonations

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Function:

After Air Volcano mission is flown, provide ENGR OC start point and end point for minefield

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:

Inform OC and firemarker of smart mine locations

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:

Notify TAF analyst when unit dispatches ORSMC and provide initial start location and planned route

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:

Record location of smart mines received from TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:

As vehicles approach mines inform OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 42 *RANGE* Medium

Concept:

Automate Mine/Sensor Effects

Function:

As vehicles or personnel approach range detection capability of sensors inform OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 42 *RANGE* Medium

Function:

Mark smart mine detonation when directed by TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 42 *RANGE* Medium

Function:

Annotate smart mine location on TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 41 *RANGE* Medium

Function:

Mark mine detonations with simulators when required

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 41 *RANGE* Medium

Function:

Notify TAF analyst when fires marked

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 40 *RANGE* Medium

Function:

Record obstacle type, location, size, orientation, and destruct time (for minefields) and forward information to TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 40 *RANGE* Medium

Function:

Coordinate with OPFOR TAF LNO on smart mine locations

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 39 *RANGE* Medium

Function:

Record smart mine locations received from TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 37 *RANGE* Medium

Concept:

Automate Mine/Sensor Effects

Function:

If another player vehicle(s) enters effective radius of smart mine or dumb mine while ORSMC is clearing route, administratively kill vehicle(s) from TAF

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 33 *RANGE* low

Function:

Receive air Volcano minefield start point and endpoint from AVN OC

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 33 *RANGE* low

Function:

When notified by TAF (or visually observe) that vehicles or personnel are approaching sensor detection range, verify vehicle/personnel location and inform remote control station of type vehicles or personnel, location, and direction of movement

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 32 *RANGE* low

Function:

When notified by TAF that vehicle is approaching mine, mark engagement with signal flare, and grenade simulator

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 32 *RANGE* low

Function:

When vehicle approaches mine, mark engagement with grenade simulator

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 32 *RANGE* low

Function:

If remote vehicle runs over dumb mine (blue concrete or wood simulated mine) kill remote vehicle with control gun and inform TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 30 *RANGE* low

Function:

Notify closest firemarker to mark minefield

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 29 *RANGE* low

Concept:

Automate Mine/Sensor Effects

Function:

Turn off SAWE as requested by OC

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					29	low

Function:

Direct firemarker(s) to vicinity of OPFOR smart mine locations

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					27	low

Function:

If breaching vehicle contacts mines mark mine detonation with simulators when required

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					26	low

Associated Unattainable Feedback for Concept

Concept:

Automate Mine/Sensor Effects

Unattainable Feedback Concept Score: 816	*This concept provides* 12 *of 96 total Unattainable Feedback elements or* 12.50% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Mine detected targets reported

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Mines command detonated

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Reinforcing fires requested by mines

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Remote control Station communication with mine sensors for: - Mine Command detonation

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Remote control Station communication with mine sensors for: - Mine detected targets reported

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Remote control Station communication with mine sensors for: - Mine requests for reinforcing fires

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Remote Control Station communication with sensors for: - Sensor detected targets

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Remote Control Station communication with sensors for: - Sensor target classification

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Remote Control Station communication with sensors for: - Sensor tracking

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Sensor classification

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Sensor detected targets

Concept:

Automate Mine/Sensor Effects

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Sensor tracking

Systems Associated with Concept

Concept:

Automate Mine/Sensor Effects

Concept System Score: 50 ***This concept affects 19 of 155 total Systems or 12.26%.***

BOS	*System*	*Fielding Value*
MS	Anti-Personnel Mine M16A1	3
MS	Hand Emplaced Wide Area Munition (WAM) M93	3
MS	Intelligent Minefield (IMF) ATD	3
MS	Modular Pack Mine Systems (MOPMS)	3
MS	Volcano Multiple Delivery Mine System	3
MS	Anti-Personnel Mine M14	3
MS	Wolverine	3
MS	Anti-Tank Mine M21	3
MS	M58A4 Mine Clearing Line Charge (MICLIC)	3
MS	Panther Mine Clearing System	3
MS	Robotic Countermine Vehicle (ROC-V)	3
MS	Lightweight Airborne Multispectral Countermine Detection System TD	3
MS	Mine Hunter Killer ATD	2
MS	Grizzly (formerly known as the M1 breacher)	2
MS	Joint Countermine Advanced Concept Technology Demonstration (CM ACTD)	2
MS	Off Road Smart Mine Clearance	2
MS	RAPTOR-Intelligent Combat Outpost	2
MS	Integrated Acoustic system (IAS)	2
MS	Vehicular Mounted Mine Detector TD	2

Overall Concept Scores

Concept

Field and Upgrade Light Weight PDD

Concept Function Score:	970	*This concept automates* 18 *of 228 total Functions or* 7.89% .
Unattainable Feedback Score:	1156	*This concept provides* 17 *of 96 Unattainable Feedback elements or* 17.71%
Concept System Score:	84	*This Concept affects* 31 *of 155 total Systems or* 20.00%
TOTAL Concept Score:	**2210**	

Associated Feedback Elements for Concept

Concept:
Field and Upgrade Light Weight PDD

This concept automates 27 of 161 total Trainer Provided Feedback elements or 16.77% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Kill code

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
NBC Reports generated

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Out of action for control gun assessments

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Pairing of shooter to victim for control gun assessments

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Players receive feedback from MOPP gear exchange, and decontamination actions

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Players receive feedback from their responses to warnings (MOPP procedures, vehicle overpressurization)

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Shooter location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Victim ID

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Victim indication of attack results: - Combat effective

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Victim indication of attack results: - KIA

Concept:

Field and Upgrade Light Weight PDD

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Victim indication of attack results: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Victim indication of attack results: - WIA (Type wounds)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - Combat effective

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - KIA

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - Out of action

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - Type combat damage

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - WIA (Type wounds)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of chemical attack

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of impacting ordnance (may not be timely)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of mine effects: - Catastrophic kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of mine effects: - Fully operational

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of ordnance effects: - Catastrophic kill

Concept:

Field and Upgrade Light Weight PDD

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Weapon ranging capability

Functions Associated with Concept

Concept:

Field and Upgrade Light Weight PDD

Concept Function Score 970	*This concept automates* 18 *of 228 total Functions or* 7.89%.

Function:

Plot affected area in TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* — *SCORE* 66 — *RANGE* HIGH

Function:

Record and report shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 62 — *RANGE* HIGH

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, type wounds for WIA, and KIA)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 61 — *RANGE* HIGH

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES, limitations, and close-in engagements)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 59 — *RANGE* Medium

Function:

Record and report victim ID and location for manual casualty and battle damage assessments

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 58 — *RANGE* Medium

Function:

Obtain and record "kill codes" for OPFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 57 — *RANGE* Medium

Concept:

Field and Upgrade Light Weight PDD

Function:

Obtain and record "kill codes", Hit/Kill aspect angle, and type combat damage for BLUFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Plot affected area in TAF work station for SAWE assessment

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Record and report Combat effective, Out of action, WIA's and KIA's from masking procedures assessment

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Record and report to TAF analyst and all Task Force OC's the NBC reports sent

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Initiate indication of correct Biological/Chemical attack

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Receive Biological/Chemical mission attack data from OPFOR

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Assess casualties as required based on reaction to biological/chemical attack

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Mark location of Biological/Chemical attack with exploding ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Concept:

Field and Upgrade Light Weight PDD

Function:

Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

Inform OC of attack location, area affected, and agent type

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

When directed by the OC fire the mission to provide graphical description of engagement footprint

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 36 *RANGE* low

Function:

Receive attack information from TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 33 *RANGE* low

Associated Unattainable Feedback for Concept

Concept:
Field and Upgrade Light Weight PDD

Unattainable Feedback Concept Score: 1156	***This concept provides*** 17 ***of 96 total Unattainable Feedback elements or*** 17.71% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Kill Code

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***
Location of impacting ordnance (direct hits only)

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Pairing of shooter to victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Pairing of shooter to victim for MILES engagements

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Shooter location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim status: - C4I kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim status: - Combat effective

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim status: - KIA

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***
Victim status: - Out of action

Concept:

Field and Upgrade Light Weight PDD

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - WIA (Type wounds)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Combat effective

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - K IA

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Out of action

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - WIA (Type wounds)

Systems Associated with Concept

Concept:

Field and Upgrade Light Weight PDD

Concept System Score: 84 ***This concept affects 31 of 155 total Systems or 20.00%.***

BOS	*System*	*Fielding Value*
MS	Aqueous Foam Barrier	3
MS	Electric Water Cannon	3
MS	Anti-Personnel Mine M14	3
MS	Anti-Personnel Mine M16A1	3
MS	Volcano Multiple Delivery Mine System	3
MS	Ground Emplaced Mine Scattering System (GEMMS)	3
MS	Modular Pack Mine Systems (MOPMS)	3
MVR	M18A1, Claymore Mine	3
MVR	M16A2 Rifle	3
MVR	12 Gauge Round (Rubber Ball) TD	3
MVR	Land Warrior System	3
MVR	M249 Squad Automatic Weapon (SAW)	3
MVR	MK-19 40mm Grenade Machine Gun	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, M230 30mm Chain Gun	3
MVR	HYDRA-70 Rocket System	3
MVR	M203 Grenade Launcher	3
MVR	Abrams Tank, M240 7.62 Cal Coaxial Machine Gun	3
MVR	12-Gauge Round (Bean Bag) TD	3
MVR	Mid-Sized Riot Control Dispenser TD	3
MVR	Field Expedient Foam TD	3
MVR	Non-Lethal Entanglement TD	3
MVR	Non-Lethal Marker Munition TD	3
MVR	Abrams Tank, M2 .50 Cal Machine Gun	3
MS	Joint Service Aviation Mask (JSAM)	2
MS	Joint Service General Purpose Mask (JSGPM)	2
MVR	Objective Sniper Weapon	2
MVR	Objective Crew Served Weapon (OCSW)	2
MVR	Objective Individual Combat Weapon (OICW)	2
MVR	RAH-66 Comanche 20mm Chain Gun	2
MVR	Integrated Sight (IS) TD	2

Concept:

Field and Upgrade Light Weight PDD

MVR	Objective Personal Weapon	1

Overall Concept Scores

Concept

Automate NBC/Smoke Effects

Concept Function Score:	1588	***This concept automates 31 of 228 total Functions or 13.60%.***
Unattainable Feedback Score:	136	***This concept provides 2 of 96 Unattainable Feedback elements or 2.08%.***
Concept System Score:	29	***This Concept affects 13 of 155 total Systems or 8.39%.***
TOTAL Concept Score:	**1753**	

Associated Feedback Elements for Concept

Concept:
Automate NBC/Smoke Effects

This concept automates 33 of 161 total Trainer Provided Feedback elements or 20.50% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
BIDS System location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Biological agent type

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Chemical agent type

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Elements receiving NBC reports

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Geographical area affected

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Location of delivery means

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***
Means to stimulate indication of biological agent attack

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
NBC Reports generated

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Obscurant effect on smoking unit

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Obscurant effect on victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Obscurant type

Concept:

Automate NBC/Smoke Effects

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Other players/units receive feedback from their responses to BIDS warnings

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Players receive feedback from MOPP gear exchange, and decontamination actions

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Players receive feedback from MOPP gear exchange, filter replacement, and decontamination actions

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Players receive feedback from their responses to warnings (MOPP procedures, vehicle overpressurization)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Type delivery means

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim ID

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Victim indication of attack results: - Combat effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Victim indication of attack results: - KIA

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Victim indication of attack results: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Victim indication of attack results: - WIA (Type wounds)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Combat effective

Concept:
Automate NBC/Smoke Effects

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - KIA

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - Out of action

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Victim status: - WIA (Type wounds)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual indication of ordnance effects: - Combat Effective

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual indication of ordnance effects: - Out of action

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of agent detection alarm activation

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Visual/audible indication of chemical attack

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Weather data

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Wind direction

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Wind speed

Functions Associated with Concept

Concept:
Automate NBC/Smoke Effects

Concept Function Score 1588 ***This concept automates*** 31 ***of 228 total Functions or*** 13.60%.

Function:
Plot affected area in TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 66 *RANGE* HIGH

Function:
Announce findings on NBC report dissemination on control net

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 64 *RANGE* HIGH

Function:
Receive attack location, and agent type from TAF analyst, initiate chemical attack

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 61 *RANGE* HIGH

Function:
Determine if NBC report received by player counterpart

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 60 *RANGE* Medium

Function:
Receive attack location, and agent type from TAF analyst, initiate biological attack

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 60 *RANGE* Medium

Function:
Evaluate BIDS procedures, report WIA, KIA, and engagement results to TAF analyst

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 58 *RANGE* Medium

Function:
Evaluate MICAD procedures, report WIA, KIA, and engagement results to TAF analyst

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 58 *RANGE* Medium

Concept:

Automate NBC/Smoke Effects

Function:

Plot affected area in TAF work station for SAWE assessment

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Record and report Combat effective, Out of action, WIA's and KIA's from masking procedures assessment

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Record and report to TAF analyst and all Task Force OC's the NBC reports sent

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Initiate indication of correct Biological/Chemical attack

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Receive Biological/Chemical mission attack data from OPFOR

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Introduce indication of biological agents

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 55 *RANGE* Medium

Function:

Receive biological mission attack data from OPFOR

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 55 *RANGE* Medium

Function:

Assess casualties as required based on reaction to biological/chemical attack

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Concept:

Automate NBC/Smoke Effects

Function:

Determine wind direction and speed, vehicle positioning, start time, duration, delivery means, and type smoke employed

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Mark location of Biological/Chemical attack with exploding ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Mark location of chemical attack with exploding ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 50 *RANGE* Medium

Function:

Inform TAF analyst of number of WIA and KIA

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 49 *RANGE* Medium

Function:

Introduce indication of correct chemical agent type

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 49 *RANGE* Medium

Function:

Record obscurant effects on player and OPFOR

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 47 *RANGE* Medium

Function:

Enter and plot area obscured into TAF work station

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

Inform OC of attack location, area affected, and agent type

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Concept:
Automate NBC/Smoke Effects

Function:
Inform OC of type agent and affected area

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:
Receive chemical mission attack data from OPFOR

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:
Record BIDS evaluation, casualty information, and victim(s) ID received from OC's

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:
Record MICAD evaluation, casualty information, and victim(s) ID received from OC's

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:
Inform TAF analyst and all Task Force OC's of reports sent

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Function:
Validate BIDS location and detection capability

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:
Receive attack information from TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 33 *RANGE* low

Function:
Record Smoke Generator information received from OC

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 21 *RANGE* low

Associated Unattainable Feedback for Concept

Concept:

Automate NBC/Smoke Effects

Unattainable Feedback Concept Score: 136	***This concept provides*** 2 ***of 96 total Unattainable Feedback elements or*** 2.08% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Location of shooter and victim when inter-visible and exposure time

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

MICAD sensors location

Systems Associated with Concept

Concept:

Automate NBC/Smoke Effects

Concept System Score: 29 ***This concept affects*** 13 ***of 155 total Systems or*** 8.39% .

BOS	*System*	*Fielding Value*
MS	M93A1 FOX Nuclear, Biological, Chemical Reconnaissance System	3
MS	Biological Integrated Detection System (BIDS)	3
MS	Smoke Generator M56	3
MS	Mechanized Smoke Generator M58 (Wolf)	3
MS	Liquid Surface Detection TD	2
MS	Joint Warning and Reporting Network	2
MS	Joint Chemical Agent Detector	2
MS	Chemical Imaging Sensor Demonstration TD	2
MS	Multipurpose Integrated Chemical Agent Alarm (MICAD)	2
MS	Integrated Biodetection TD	2
MS	Biological Remote Early Warning Advanced Concept TD	2
MS	Millimeter Wave Screening	2
MS	Multispectral Smoke	1

Overall Concept Scores

Concept

Instrument Unmanned Aerial Vehicle (UAV) and interface Ground Control Station(GCS) with the IS

Concept Function Score:	478	*This concept automates* 10 *of 228 total Functions or* 4.39% .
Unattainable Feedback Score:	544	*This concept provides* 8 *of 96 Unattainable Feedback elements or* 8.33%.
Concept System Score:	24	*This Concept affects* 9 *of 155 total Systems or* 5.81%.
TOTAL Concept Score:	**1046**	

Associated Feedback Elements for Concept

Concept:

Instrument Unmanned Aerial Vehicle (UAV) and interface Ground Control

This concept automates 12 of 161 total Trainer Provided Feedback elements or 7.45% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Acquired targets type and location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Aircraft flight plan

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Go/No Go on Hand-off procedures

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Planned/Revised flight plan

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Revised flight plan

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
Search sector area and target criteria

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
System ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
System location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
System range capability

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
UAV flight plan

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***
UAV ID

Concept:

Instrument Unmanned Aerial Vehicle (UAV) and interface Ground Control

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

UAV location

Functions Associated with Concept

Concept:

Instrument Unmanned Aerial Vehicle (UAV) and interface Ground Control

Concept Function Score 478	*This concept automates* 10 *of* 228 *total Functions or* 4.39%.

Function:

Record and report type target and location for any targets acquired after UAV hand-off

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Record and report aircraft flight plan and search sector for entry into TAF workstation, update changes as required

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Record and report UAV flight plan and search sector for entry into TAF work station, update changes as required

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Record and report type target and location for any UAV targets acquired

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

Record and report revised UAV search criteria

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Record and report System ID, Location, and range capability

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Record and report type target and location for any targets acquired

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Concept:

Instrument Unmanned Aerial Vehicle (UAV) and interface Ground Control

Function:

Record and report UAV flight route, search sector, and target criteria for entry into TAF work station

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 44	*RANGE* Medium

Function:

Record and report UAV search criteria

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 44	*RANGE* Medium

Function:

Report changes to flight plan as required

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 44	*RANGE* Medium

Associated Unattainable Feedback for Concept

Concept:

Instrument Unmanned Aerial Vehicle (UAV) and interface Ground Control

Unattainable Feedback Concept Score: 544	*This concept provides* 8 *of 96 total Unattainable Feedback elements or* 8.33% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Revised UAV flight plan

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Target location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Target type

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Time tagged video display

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

UAV status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

UAV status: - Communications kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of UAV status: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of UAV status: - Communications kill

Systems Associated with Concept

Concept:

Instrument Unmanned Aerial Vehicle (UAV) and interface Ground Control

Concept System Score: 24 ***This concept affects*** 9 ***of 155 total Systems or*** 5.81%.

BOS	*System*	*Fielding Value*
INT	Synthetic Aperture Radar (SAR) Target Recognition and Location System (STARLOS)	3
INT	ORION	3
INT	Hunter Unmanned Aerial Vehicle (UAV)	3
INT	Aerial Scout Sensor Integration TD	3
INT	Maneuver UAV	3
INT	Bird Dog UAV	3
INT	Multimission/Common Modular UAV Sensors TD	2
INT	Masked Targeting TD	2
INT	Machine Vision for Autonomous Unmanned Ground Vehicle (UGV) TD	2

Overall Concept Scores

Concept

Pair Shooter to Misses

Concept Function Score:	596	***This concept automates 13 of 228 total Functions or 5.70% .***
Unattainable Feedback Score:	408	***This concept provides 6 of 96 Unattainable Feedback elements or 6.25%.***
Concept System Score:	84	***This Concept affects 35 of 155 total Systems or 22.58%.***
TOTAL Concept Score:	**1088**	

Associated Feedback Elements for Concept

Concept:

Pair Shooter to Misses

This concept automates 6 of 161 total Trainer Provided Feedback elements or 3.73% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Ammunition type and amount fired

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Ammunition type and amount on hand

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim location

Functions Associated with Concept

Concept:

Pair Shooter to Misses

Concept Function Score 596	*This concept automates* 13 *of 228 total Functions or* 5.70%.

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, type wounds for WIA, and KIA)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 61 *RANGE* HIGH

Function:

Record and report victim ID and location of vehicles that are affected by smoke

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Receive engagement information from OC and enter into TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Coordinate with fire marker on vehicle ID's and location of victims affected by smoke

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 55 *RANGE* Medium

Function:

Assess vehicle(s) with control gun as directed by TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Compile total Avenger shots taken from all OC's and provide information to DTOC counterpart for casualty assessment

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

OC notifies TAF of shooter ID, location, target location, type and amount ammunition fired

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Concept:

Pair Shooter to Misses

Function:

Monitor Avenger ID, location, and number of Avenger shots taken at fixed wing aircraft for each Avenger

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					43	Medium

Function:

Locate nearest fire marker to mark mission with smoke to depict engagement

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					42	Medium

Function:

Report number of Avenger shots taken to TAF analyst

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					40	Medium

Function:

When casualty assessment complete inform appropriate OC of victim ID, location, and victim status for engagement results

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					37	Medium

Function:

Receive information from OC on number of Avenger shots taken during engagement

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					34	low

Function:

Record and report Avenger ID and Location

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					29	low

Associated Unattainable Feedback for Concept

Concept:

Pair Shooter to Misses

Unattainable Feedback Concept Score: 408	*This concept provides* 6 *of 96 total Unattainable Feedback elements or* 6.25% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Ammunition type and amount on hand

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Location of impacting ordnance (other than direct hits)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Pairing of shooter to MISSES

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Shooter ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Shooter location

Systems Associated with Concept

Concept:

Pair Shooter to Misses

Concept System Score: 84 ***This concept affects 35 of 155 total Systems or 22.58%.***

BOS	*System*	*Fielding Value*
MVR	M830 High Explosive Anti-Tank Multipurpose (HEAT-MP-T) Round	3
MVR	Abrams Tank, M2 .50 Cal Machine Gun	3
MVR	Direct Fire Lethality ATD	3
MVR	Combustion Engine Defeat Mechanism TD	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE II	3
MVR	Bradley Fighting Vehicle, 25mm Cannon	3
MVR	Longbow Apache AH-64D Helicopter LONGBOW HELLFIRE Missile	3
MVR	M829A2 Armor Piercing, Fin Stabilized, Discarding Sabot, Tracer (APFSDS-T) Round	3
MVR	HYDRA-70 Rocket System	3
MVR	MK-19 40mm Grenade Machine Gun	3
MVR	Apache AH-64A Helicopter, HELLFIRE Missile	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, M230 30mm Chain Gun	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, HELLFIRE II Missile	3
MVR	AH-64D Longbow Apache Helicopter, HELLFIRE Missile	3
MVR	RAH-66 Comanche LONGBOW HELLFIRE Missile	3
MVR	Abrams Tank, Main Gun	3
MVR	Abrams Tank, M240 7.62 Cal Coaxial Machine Gun	3
MVR	M16A2 Rifle	3
MVR	Future missile Technology Integration (FMTI)	2
MVR	Full Spectrum Threat Protection TD	2
MVR	Ground Vehicle Distributed Defense TD	2
MVR	Hit Avoidance ATD	2
MVR	Kinetic Energy Tungsten Core (KE-T) Round	2
MVR	Line of Sight Anti-Tank (LOSAT) ATD	2
MVR	Multispectral Countermeasures (MSCM) ATD	2
MVR	Objective Crew Served Weapon (OCSW)	2
MVR	RAH-66 Comanche 20mm Chain Gun	2
MVR	Tank Extended Range Munition (TERM) TD	2
MVR	Integrated Situational Awareness and Countermeasures (ISCAM) TD	2

Concept:

Pair Shooter to Misses

MVR	Future Infantry Fighting Vehicle (FIFV)	1
MVR	Future Combat System (FCS)	1
MVR	Brilliant Helicopter Advanced Weapons (BHAW) TD	1
MVR	Objective Personal Weapon	1
MVR	Rotorcraft Air Combat Enhancement (RACE)	1

Overall Concept Scores

Concept

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

Concept Function Score:	438	***This concept automates*** 11 ***of 228 total Functions or*** 4.82% .
Unattainable Feedback Score:	272	***This concept provides*** 4 ***of 96 Unattainable Feedback elements or*** 4.17%.
Concept System Score:	4	***This Concept affects*** 2 ***of 155 total Systems or*** 1.29%.
TOTAL Concept Score:	**714**	

Associated Feedback Elements for Concept

Concept:

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

This concept automates 26 of 161 total Trainer Provided Feedback elements or 16.15% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Ammunition type and amount fired

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Ammunition type and amount on hand

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Observer ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Observer location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Pairing of shooter to victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Planned flight route

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Time missile launched

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim ID

Concept:

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

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Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Catastrophic kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Communications kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Firepower kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Fully operational

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Mobility kill

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Victim status: - Type combat damage

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of ordnance effects: - Communications kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Visual/audible indication of ordnance effects: - Mobility kill

Concept:

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Weapon ranging capability

Functions Associated with Concept

Concept:

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

Concept Function Score 438	*This concept automates* 11 *of* 228 *total Functions or* 4.82%.

Function:

Plot loiter radius of weapon to determine weapon search footprint

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Plot planned flight route

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Provide TAF analyst the launcher ID, planned flight route, ammunition on hand, and time missile launched

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Monitor observer ID, target location, and description received from UAV

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Function:

If vehicle is located at mission target location, assess battle damage based on maximum PK

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 41 *RANGE* Medium

Function:

Forward UAV target information to TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 39 *RANGE* Medium

Function:

If calculation of PK results in kill, administratively kill vehicle from TAF facility

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 34 *RANGE* low

Concept:

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

Function:

Plot target location received from S2 OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 34 *RANGE* low

Function:

If PK does not result in kill, locate nearest firemarker and send him to mark location of impacting ordnance misses

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 33 *RANGE* low

Function:

Identify Enhanced Fiber Optic Guided Missile (EFOGM) shooter on TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 31 *RANGE* low

Function:

If no vehicle is located at mission target location but within weapon search footprint, assess battle damage at lower PK

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 31 *RANGE* low

Associated Unattainable Feedback for Concept

Concept:

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

Unattainable Feedback Concept Score: 272	*This concept provides* 4 *of 96 total Unattainable Feedback elements or* 4.17% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Actual flight route

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Needs to "fly" weapon to target and "see" terrain under weapon to navigate on preplanned route and hit target

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Pairing of shooter to MISSES

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible signature when weapon fires

Systems Associated with Concept

Concept:

Automate Enhanced Fiber Optic Guided Missile (EFOGM) Simulation

Concept System Score: 4 ***This concept affects*** 2 ***of 155 total Systems or*** 1.29%.

BOS	*System*	*Fielding Value*
FS	Multimode Airframe Technology (MAT) TD (LONGFOG)	2
FS	Enhanced Fiber Optic Guided Missile (EFOGM) ATD	2

Overall Concept Scores

Concept

Automate RSTA Systems Detection Information

Concept Function Score:	403	*This concept automates* 8 *of 228 total Functions or* 3.51% .
Unattainable Feedback Score:	136	*This concept provides* 2 *of 96 Unattainable Feedback elements or* 2.08%.
Concept System Score:	40	*This Concept affects* 15 *of 155 total Systems or* 9.68%.
TOTAL Concept Score:	**579**	

Associated Feedback Elements for Concept

Concept:

Automate RSTA Systems Detection Information

This concept automates 16 of 161 total Trainer Provided Feedback elements or 9.94% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Acquired targets type and location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Number of targets detected

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Search sector area and target criteria

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Sensor area of coverage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Sensor locations

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Sensor monitor set ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Sensor monitor set location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Sensor types used

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

System search sector

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target direction

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target direction and speed

Concept:

Automate RSTA Systems Detection Information

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target location, direction, speed

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target speed

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target type

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Target type and location

Functions Associated with Concept

Concept:

Automate RSTA Systems Detection Information

Concept Function Score 403	*This concept automates* 8 *of 228 total Functions or* 3.51%.

Function:

Record and report target type, location, direction, speed, and time detected for all targets found

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 69 *RANGE* HIGH

Function:

Record and report type target, location, strength, and activity for any targets acquired

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 55 *RANGE* Medium

Function:

Record and report GSR search sector to TAF analyst for entry into TAF work station

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Record and report sensor coverage area, locations, and sensor type for entry into TAF work station

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Record and report type target and location for any targets acquired

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Record and report search criteria

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:

Record and report search sector and target criteria for entry into TAF work station, update changes as required

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 42 *RANGE* Medium

Concept:

Automate RSTA Systems Detection Information

Function:

Record and report Sensor Monitor Set ID and location

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					41	Medium

Associated Unattainable Feedback for Concept

Concept:

Automate RSTA Systems Detection Information

Unattainable Feedback Concept Score: 136	*This concept provides* 2 *of 96 total Unattainable Feedback elements or* 2.08% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Player response to target acquisition

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Time tagged video display

Systems Associated with Concept

Concept:

Automate RSTA Systems Detection Information

Concept System Score: 40 ***This concept affects 15 of 155 total Systems or 9.68%.***

BOS	***System***	***Fielding Value***
INT	Moving Target Locating Radar (MTLR) AN/TPS-58B	3
INT	Moving Target Locating Radar (MTLR) AN/TPS-25A	3
INT	Ground Surveillance Radar (GSR) AN/PPS-5	3
INT	Ground Surveillance Radar (GSR) AN/PPS-15	3
INT	Improved REMBASS (IREMBASS)	3
INT	Remotely Monitored Battlefield Sensor System (REMBASS)	3
INT	Long Range Advanced Scout Surveillance System (LRAS3)	3
INT	Light and Special Division Interim Sensor (LSDIS)	3
INT	Hunter Sensor Suite (ATD)	3
INT	FAAD Ground Based Sensor	3
INT	Multifunction Staring Sensor Suite ATD	2
INT	Target Acquisition ATD	2
INT	Future Scout and Cavalry System (FSCS) ATD	2
INT	Ground Based Sensor	2
INT	Ground Based Common Sensor	2

Overall Concept Scores

Concept

Provide Tactile Feedback to Support Non-Lethal Engagements

Concept Function Score:	470	***This concept automates*** 8 ***of 228 total Functions or*** 3.51% .
Unattainable Feedback Score:	0	***This concept provides*** 0 ***of 96 Unattainable Feedback elements or*** 0% .
Concept System Score:	6	***This Concept affects*** 2 ***of 155 total Systems or*** 1.29% .
TOTAL Concept Score:	**476**	

Associated Feedback Elements for Concept

Concept:

Provide Tactile Feedback to Support Non-Lethal Engagements

This concept automates 12 of 161 total Trainer Provided Feedback elements or 7.45% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Barrier agent, location, (xyz) dimensions, and orientation

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Location of breach/lane

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter location

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Victim degree of degradation: - Irritant warning (near miss indication)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Victim degree of degradation: - WIA (NON LETHAL wounds)

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Combat effective

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Out of action

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - WIA (NON-LETHAL wounds)

Concept:

Provide Tactile Feedback to Support Non-Lethal Engagements

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of effects on antagonist

Functions Associated with Concept

Concept:

Provide Tactile Feedback to Support Non-Lethal Engagements

Concept Function Score 470	*This concept automates* 8 *of 228 total Functions or* 3.51%.

Function:

Assess victim degree of degradation: - Provide victims a NEAR MISS indication for IRRITANT warning

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 87 *RANGE* HIGH

Function:

Record and report dismounted entity ID, location, and status (Combat effective, Out of action, and WIA)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 67 *RANGE* HIGH

Function:

Record and report barrier location, barrier agent type, (xyz) dimensions, and orientation

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Resurrect WIA's as required based on self-aid and buddy-aid

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 55 *RANGE* Medium

Function:

Assess victim degree of degradation: - Execute control gun KILL for WIAs (NON LETHAL wounds)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Plot barrier location and affected area in TAF work station

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Plot location of breach/lanes as required

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Concept:

Provide Tactile Feedback to Support Non-Lethal Engagements

Function:

Record and report location of breach/lane as required

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					43	Medium

Associated Unattainable Feedback for Concept

Concept:

Provide Tactile Feedback to Support Non-Lethal Engagements

Unattainable Feedback Concept Score. 0	*This concept provides* 0 *of 96 total Unattainable Feedback elements or* 0% .

Feedback Element: ☐ *Intrinsic* ☐ *Extrinsic* ☐ *Unattainable*

NO UNATTAINABLE FEEDBACK ASSOCIATED WITH CONCEPT

Systems Associated with Concept

Concept:

Provide Tactile Feedback to Support Non-Lethal Engagements

Concept System Score: 6 ***This concept affects*** 2 ***of 155 total Systems or*** 1.29%.

BOS	***System***	***Fielding Value***
MS	Aqueous Foam Barrier	3
MVR	Field Expedient Foam TD	3

Overall Concept Scores

Concept

Automate Stimulation of Counterfire Radars

Concept Function Score:	316	***This concept automates 7 of 228 total Functions or 3.07% .***
Unattainable Feedback Score:	0	***This concept provides 0 of 96 Unattainable Feedback elements or 0% .***
Concept System Score:	9	***This Concept affects 3 of 155 total Systems or 1.94%.***
TOTAL Concept Score:	**325**	

Associated Feedback Elements for Concept

Concept:

Automate Stimulation of Counterfire Radars

This concept automates 6 of 161 total Trainer Provided Feedback elements or 3.73% .

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Counter-Fire missions received

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Graphical depiction of engagement footprint

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Time missile launched

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Time radar detected mission received

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Time radar section sent Counter-Fire mission to supporting FDC

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Time RSS data sent to radar

Functions Associated with Concept

Concept:

Automate Stimulation of Counterfire Radars

Concept Function Score 316	*This concept automates* 7 *of 228 total Functions or* 3.07%.

Function:

Record Radar fire missions received

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 60 *RANGE* Medium

Function:

Record assessment of radar section procedures

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 54 *RANGE* Medium

Function:

Coordinate with OPFOR LNO to receive OPFOR artillery and mortar fire missions

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Enter OPFOR fire mission data into Radar Simulation System (RSS) work station to determine radar activity status

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:

If RSS determines radar would have detected fire mission, transmit RSS trajectory, point of origin, and impact data to appropriate radar

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 43 *RANGE* Medium

Function:

Record time mission sent to supporting FDC

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 41 *RANGE* Medium

Function:

Record time RSS mission received by radar section

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 30 *RANGE* low

Associated Unattainable Feedback for Concept

Concept:

Automate Stimulation of Counterfire Radars

Unattainable Feedback Concept Score: 0	***This concept provides*** 0 ***of 96 total Unattainable Feedback elements or*** 0% .

Feedback Element: ☐ ***Intrinsic*** ☐ ***Extrinsic*** ☐ ***Unattainable***

NO UNATTAINABLE FEEDBACK ASSOCIATED WITH CONCEPT

Systems Associated with Concept

Concept:

Automate Stimulation of Counterfire Radars

Concept System Score: 9 ***This concept affects*** 3 ***of 155 total Systems or*** 1.94%.

BOS	*System*	*Fielding Value*
INT	Bistatic Radar	3
INT	Firefinder Q37	3
INT	Firefinder Q36 Radar	3

Overall Concept Scores

Concept

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Concept Function Score:	1789	*This concept automates* 39 *of 228 total Functions or* 17.11%.
Unattainable Feedback Score:	544	*This concept provides* 8 *of 96 Unattainable Feedback elements or* 8.33%.
Concept System Score:	54	*This Concept affects* 22 *of 155 total Systems or* 14.19%
TOTAL Concept Score:	**2387**	

Associated Feedback Elements for Concept

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

This concept automates 33 *of 161 total Trainer Provided Feedback elements or* 20.50% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Ammunition type and amount on hand

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Data in Call for Fire

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Go/No Go on FDC procedures

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Go/No Go on FO/COLT procedures

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Go/No Go on gun section procedures

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Graphical depiction of engagement footprint

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*

Location of impacting ordnance (may not be timely)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Observer ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Observer location

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*

Shooter ID

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Shooter location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Communications kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Firepower kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Fully operational

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Mobility kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Type combat damage

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Firepower kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Mobility kill

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

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Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance location

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of impacting ordnance (may not be timely)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Communications kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Type combat damage

Functions Associated with Concept

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Concept Function Score 1789	*This concept automates* 39 *of* 228 *total Functions or* 17.11%.

Function:

Direct TAF to "turn off" SAWE and manually assess minefield effects during breaching operations

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 85 *RANGE* HIGH

Function:

Confirm minefield location with TAF using PDD

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 68 *RANGE* HIGH

Function:

Verify minefield location (OC uses PDD to mark each corner of the minefield. TAF analyst confirms that SAWE minefield displayed on TAF computer coincides with area marked by ENGR OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 67 *RANGE* HIGH

Function:

If FDC and Gun section procedures valid when LAST Round of FASCAM is fired, tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 66 *RANGE* HIGH

Function:

Confirm minefield is in correct location with the ENGR OC

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 65 *RANGE* HIGH

Function:

Receive engagement results from TAF analyst, if non-instrumented or non-tracking targets were properly engaged, direct OC closest to target location to administratively kill vehicle

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 65 *RANGE* HIGH

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Function:

For FASCAM, mark each of four corners with flagged barber poles

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 63 *RANGE* HIGH

Function:

Mark fires with air and ground burst simulators, smoke, or flares as directed by the TAF

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 59 *RANGE* Medium

Function:

If FDC and Gun section procedures valid when LAST Round of SADARM is fired, tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Assess Call for Fire and Laser designation procedures

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Navigate to location of impacting ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 52 *RANGE* Medium

Function:

If ammunition on hand and Gun section procedures valid inform FDC OC

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 50 *RANGE* Medium

Function:

If FDC and Gun section procedures valid tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 50 *RANGE* Medium

Function:

Allow SAWE to assess target(s) in search footprint for 8-10 seconds, when search time has elapsed, turn off SAWE footprint

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 48 *RANGE* Medium

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Function:

If fires are smoke or illumination missions, locate the nearest fire marker to mark fires

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 47 *RANGE* Medium

Function:

If FO/COLT, FDC, and Gun section procedures valid tell TAF analyst to fire mission

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

If fires fall on OPFOR notify nearest firemarker to mark location of impacting ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

If fires fall within 1,000 meters of BLUFOR forces, notify OC to mark location of impacting ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Record instrumented battle damage and OC manual assessments as required

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Coordinate with FO/COLT OC on validity of FO procedures

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Function:

If procedures valid call TAF to notify OC closest to victim(s), and tell them to administratively kill vehicle(s) depending on number of rounds fired

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Function:

Monitor observer Call for Fire procedures

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 44 *RANGE* Medium

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Function:

Receive location, volume and type ordnance to mark from TAF analyst

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE* 43	*RANGE* Medium

Function:

Notify TAF analyst when fires marked

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE* 40	*RANGE* Medium

Function:

Receive Fire Mission Data, from FDC personnel, forward target location for TAF analyst to enter into TAF work station

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE* 39	*RANGE* Medium

Function:

If fires are beyond 1,000 meters from BLUFOR, notify nearest firemarker to mark location of impacting ordnance

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE* 36	*RANGE* low

Function:

Mark center of minefield with five air and five ground burst simulators

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE* 36	*RANGE* low

Function:

Mark each corner of the minefield with two air burst simulators

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE* 36	*RANGE* low

Function:

Receive fire mission data from FDC OC and enter it into TAF work station

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE* 36	*RANGE* low

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Function:

When directed by the OC fire the mission to provide graphical description of engagement footprint

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 36 *RANGE* low

Function:

Upon request of FO/COLT OC, notify OC closest to victim(s) and direct them to administratively kill player entities

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 34 *RANGE* low

Function:

Enter four corners and center grid location of FASCAM minefield in TAF computer for SAWE assessment

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 33 *RANGE* low

Function:

IF an OC is unable to kill the player entities, administratively kill player unit(s) from the TAF

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 33 *RANGE* low

Function:

Coordinate with Battery FDC OC and PLT OC on mission procedures if required

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 31 *RANGE* low

Function:

Mark minefield with yellow smoke when vehicles are within 100 meters of minefield

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 31 *RANGE* low

Function:

Enter SADARM ordnance search footprint (400 x 400 meters) as a FASCAM minefield in the TAF work station for SAWE assessment

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 30 *RANGE* low

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Function:

Notify closest firemarker to mark fires for target(s) in search footprint

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					30	low

Function:

Notify closest firemarker to mark minefield

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					29	low

Function:

Turn off SAWE as requested by OC

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					29	low

Associated Unattainable Feedback for Concept

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Unattainable Feedback Concept Score: 544	*This concept provides* 8 *of 96 total Unattainable Feedback elements or* 8.33% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Pairing of shooter to MISSES

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual indication of engagement footprint

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual indication of ordnance effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual indication of ordnance effects: - Mobility kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Communications kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Visual/audible indication of ordnance effects: - Type combat damage

Systems Associated with Concept

Concept:

Provide Virtual Simulation of Artillery and Mortar Battlefield Effects

Concept System Score: 54 ***This concept affects 22 of 155 total Systems or 14.19%.***

BOS	*System*	*Fielding Value*
FS	Self-Propelled Howitzers M109A1, A2, A3, A4, A5	3
FS	Rocket Assisted Projectile (RAP)	3
FS	155mm Howitzer, Dual Purpose Improved Conventional Munition (DPICM) Projectile	3
FS	Paladin Howitzer	3
FS	Multiple Launch Rocket System (MLRS)	3
FS	155mm Howitzer, Field Artillery Scatterable Minefield (FASCAM) Projectile	3
FS	M198, M102, M119, Towed Howitzers	3
FS	155mm Howitzer, M712 COPPERHEAD Projectile	3
FS	155mm Howitzer, Search and Destroy Armor (SADARM) Projectile	3
FS	105mm Terminally Guided Projectile TD	3
FS	Autonomous Intelligent Submunition (AIS) TD	3
FS	High Mobility Artillery Rocket System (HIMARS) TD	2
FS	155mm Automated Howitzer (AH) TD	2
FS	Advanced Extended Range Cargo Projectile (AERCAP) TD	2
FS	Brilliant Anti-Armor Submunition (BAT)	2
FS	Guided Multiple Launch Rocket System (MLRS) ATD	2
FS	Enhanced Fiber Optic Guided Missile (EFOGM) ATD	2
FS	Indirect Precision Fire (IPF) ATD	2
FS	Multimode Airframe Technology (MAT) TD (LONGFOG)	2
FS	Precision Guided Mortar Munition (PGMM) ATD	2
FS	Crusader Howitzer	2
FS	Target Defeat Capability TD	1

Overall Concept Scores

Concept

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target Engagements

Concept Function Score:	1505	*This concept automates* 30 *of 228 total Functions or* 13.16%.
Unattainable Feedback Score:	2788	*This concept provides* 41 *of 96 Unattainable Feedback elements or* 42.71%
Concept System Score:	96	*This Concept affects* 39 *of 155 total Systems or* 25.16%
TOTAL Concept Score:	**4389**	

Associated Feedback Elements for Concept

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

This concept automates 32 *of 161 total Trainer Provided Feedback elements or* 19.88% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Ammunition type and amount on hand

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Hit/Kill aspect angle

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Kill code

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Observer ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Observer location

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Trainer Provided*
Out of action for control gun assessments

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Pairing of shooter to victim

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Pairing of shooter to victim for control gun assessments

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Shooter ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Trainer Provided*
Shooter location

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Vector pairing of shooter to victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Combat effective

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Fully operational

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - KIA

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Mobility kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Out of action

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Victim status: - WIA (Type wounds)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of impacting ordnance

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Combat Effective

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual indication of ordnance effects: - Out of action

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Trainer Provided***

Visual/audible indication of ordnance effects: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Trainer Provided***

Weapon ranging capability

Functions Associated with Concept

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Concept Function Score 1505	*This concept automates* 30 *of 228 total Functions or* 13.16%.

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, and WIA type wounds)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 73 — *RANGE* HIGH

Function:

Draw vector from Avenger to fixed wing aircraft

☐ *Intrinsic* ☑ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* — *SCORE* 67 — *RANGE* HIGH

Function:

Record and report Observer ID, location, and target location sent to shooter

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 62 — *RANGE* HIGH

Function:

Record and report dismounted entity ID, location, firing activity, and status (Combat effective, Out of action, type wounds for WIA, and KIA)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 61 — *RANGE* HIGH

Function:

Manually adjudicate battle damage and casualties for MILES/AGES II limitations (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 60 — *RANGE* Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, MILES, limitations, and close-in engagements)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* — *SCORE* 59 — *RANGE* Medium

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES/AGES II, and MILES/AGES II limitations)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 59 *RANGE* Medium

Function:

Obtain and record "kill codes" for OPFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Obtain and record "kill codes", Hit/Kill aspect angle, and type combat damage for BLUFOR victims

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Record and report victim ID and location of vehicles that are affected by smoke

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 57 *RANGE* Medium

Function:

Receive engagement information from OC and enter into TAF work station

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 56 *RANGE* Medium

Function:

Coordinate with fire marker on vehicle ID's and location of victims affected by smoke

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 55 *RANGE* Medium

Function:

Assess vehicle(s) with control gun as directed by TAF analyst

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 53 *RANGE* Medium

Function:

Mark fires with smoke as directed by the TAF

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 53 *RANGE* Medium

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Function:

Navigate to location of impacting ordnance

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☐ *TAF Analys* ☑ *Firemarker* *SCORE* 52 *RANGE* Medium

Function:

Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, and MILES limitations)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

Manually adjudicate battle damage and casualties for MILES limitations (i.e. ROE violations, inoperative MILES, MILES limitations, and close-in engagements)

☑ *Intrinsic* ☐ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 46 *RANGE* Medium

Function:

Administratively assess affected vehicle(s) with mobility kills from TAF

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Compile total Avenger shots taken from all OC's and provide information to DTOC counterpart for casualty assessment

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

If affected vehicle(s) ID not visible on TAF work station, inform firemarker to assess vehicle as mobility kill

☑ *Intrinsic* ☐ *Extrinsic* ☐ *OC* ☑ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Function:

Record shooter and victim ID for control gun assessments (i.e. ROE violations, inoperative MILES, and MILES limitations)

☐ *Intrinsic* ☑ *Extrinsic* ☑ *OC* ☐ *TAF Analys* ☐ *Firemarker* *SCORE* 45 *RANGE* Medium

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Function:

OC notifies TAF of shooter ID, location, target location, type and amount ammunition fired

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					44	Medium

Function:

Monitor Avenger ID, location, and number of Avenger shots taken at fixed wing aircraft for each Avenger

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					43	Medium

Function:

Receive location, volume and type ordnance to mark from TAF analyst

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE*	*RANGE*
					43	Medium

Function:

Locate nearest fire marker to mark mission with smoke to depict engagement

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					42	Medium

Function:

Notify TAF analyst when fires marked

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☐ *TAF Analys*	☑ *Firemarker*	*SCORE*	*RANGE*
					40	Medium

Function:

Report number of Avenger shots taken to TAF analyst

☑ *Intrinsic*	☐ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					40	Medium

Function:

When casualty assessment complete inform appropriate OC of victim ID, location, and victim status for engagement results

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					37	Medium

Function:

Receive information from OC on number of Avenger shots taken during engagement

☑ *Intrinsic*	☐ *Extrinsic*	☐ *OC*	☑ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					34	low

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Function:

Record and report Avenger ID and Location

☐ *Intrinsic*	☑ *Extrinsic*	☑ *OC*	☐ *TAF Analys*	☐ *Firemarker*	*SCORE*	*RANGE*
					29	low

Associated Unattainable Feedback for Concept

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Unattainable Feedback Concept Score: 2788	*This concept provides* 41 *of 96 total Unattainable Feedback elements or* 42.71% .

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Ammunition type and amount fired

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Ammunition type and amount on hand

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Hit/Kill aspect angle

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Kill Code

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Location of impacting ordnance (direct hits only)

Feedback Element: ☑ *Intrinsic* ☐ *Extrinsic* ☑ *Unattainable*

Location of impacting ordnance (other than direct hits)

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Location of shooter and victim when inter-visible and exposure time

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Pairing of shooter to MISSES

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Pairing of shooter to victim

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Pairing of shooter to victim for MILES engagements

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Shooter ID

Feedback Element: ☐ *Intrinsic* ☑ *Extrinsic* ☑ *Unattainable*

Shooter location

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Vector pairing of shooter to victim

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Vehicle ID with system activated

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim ID

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim location

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Catastrophic kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Communications kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Firepower kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Fully operational

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Mobility kill

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Victim status: - Type combat damage

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Combat Effective

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Firepower kill

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Mobility kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual indication of ordnance effects: - Out of action

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual signature of weapon shooting

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of impacting ordnance (direct hits only)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of impacting ordnance (other than direct hits)

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of NEAR MISS

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Catastrophic kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Communications kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Emergency landing

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Firepower kill

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Fully operational

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Mobility kill

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Precautionary landing

Feedback Element: ☑ ***Intrinsic*** ☐ ***Extrinsic*** ☑ ***Unattainable***

Visual/audible indication of ordnance effects: - Type combat damage

Feedback Element: ☐ ***Intrinsic*** ☑ ***Extrinsic*** ☑ ***Unattainable***

Weapon ranging capability

Systems Associated with Concept

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

Concept System Score: 96	*This concept affects 39 of 155 total Systems or 25.16%.*

BOS	*System*	*Fielding Value*
AD	Linebacker	3
AD	Vulcan	3
AD	Chaparral	3
AD	Avenger Air Defense System	3
AD	High Mobility Ground Launched AIM-120 Advanced Medium Range Air To Air Missile (AMRAAM) TD (HMGL-AMRAAM)	3
MS	Electric Water Cannon	3
MVR	Direct Fire Lethality ATD	3
MVR	Combustion Engine Defeat Mechanism TD	3
MVR	Bradley Fighting Vehicle, 25mm Cannon	3
MVR	Apache AH-64A Helicopter, HELLFIRE Missile	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, M230 30mm Chain Gun	3
MVR	Longbow Apache AH-64D Helicopter LONGBOW HELLFIRE Missile	3
MVR	Apache AH-64A and AH-64D Longbow Apache Helicopter, HELLFIRE II Missile	3
MVR	M829A2 Armor Piercing, Fin Stabilized, Discarding Sabot, Tracer (APFSDS-T) Round	3
MVR	M830 High Explosive Anti-Tank Multipurpose (HEAT-MP-T) Round	3
MVR	AH-64D Longbow Apache Helicopter, HELLFIRE Missile	3
MVR	Abrams Tank, Main Gun	3
MVR	RAH-66 Comanche LONGBOW HELLFIRE Missile	3
MVR	Abrams Tank, M240 7.62 Cal Coaxial Machine Gun	3
MVR	Abrams Tank, M2 .50 Cal Machine Gun	3
MVR	Kiowa OH-58D and RAH-66 Comanche HELLFIRE II	3
AD	Electronic Integrated Sensor Suite for Air Defense (EISS-AD) TD	2
AD	2.75 inch Anti-Air TD	2
MVR	Full Spectrum Threat Protection TD	2
MVR	Ground Vehicle Distributed Defense TD	2
MVR	Hit Avoidance ATD	2
MVR	Integrated Situational Awareness and Countermeasures (ISCAM) TD	2
MVR	Kinetic Energy Tungsten Core (KE-T) Round	2

Concept:

Apply Embedded Simulation to Mounted Direct-Fire Systems for Point Target

MVR	Line of Sight Anti-Tank (LOSAT) ATD	2
MVR	Low-Cost Precision Kill (LCPK) (ATG/GTG) 2.75 inch Guided Rocket TD	2
MVR	Multispectral Countermeasures (MSCM) ATD	2
MVR	RAH-66 Comanche 20mm Chain Gun	2
MVR	Tank Extended Range Munition (TERM) TD	2
MVR	Future missile Technology Integration (FMTI)	2
MVR	Future Combat System (FCS)	1
MVR	Future Infantry Fighting Vehicle (FIFV)	1
MVR	Brilliant Helicopter Advanced Weapons (BHAW) TD	1
MVR	Rotorcraft Air Combat Enhancement (RACE)	1

SYSTEM NAME	CONCEPT IN RECOMMENDED PRIORITY ORDER													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
105mm Terminally Guided Projectile TD														
12 Gauge Round (Rubber Ball) TD														
12-Gauge Round (Bean Bag) TD														
155mm Automated Howitzer (AH) TD														
155mm Howitzer, Dual Purpose Improved Conventional Munition (DPICM) Projectile														
155mm Howitzer, Field Artillery Scatterable Minefield (FASCAM) Projectile														
155mm Howitzer, M712 COPPERHEAD Projectile														
155mm Howitzer, Search and Destroy Armor (SADARM) Projectile														
2.75 inch Anti-Air TD														
Abrams Tank, M2 .50 Cal Machine Gun														
Abrams Tank, M240 7.62 Cal Coaxial Machine Gun														
Abrams Tank, Main Gun														
Advanced Extended Range Cargo Projectile (AERCAP) TD														
Advanced Manportable Sensors for the Dismounted Warrior														
Aerial Scout Sensor Integration TD														
AH-64D Longbow Apache Helicopter, HELLFIRE Missile														
Air/Land Enhanced Reconnaissance and Targeting (ALERT) ATD														
Anti-Personnel Mine M14														
Anti-Personnel Mine M16A1														
Anti-Tank Mine M21														
Apache AH-64A and AH-64D Longbow Apache Helicopter, HELLFIRE II Missile														
Apache AH-64A and AH-64D Longbow Apache Helicopter, M230 30mm Chain Gun														
Apache AH-64A Helicopter, HELLFIRE Missile														
Aqueous Foam Barrier														
Autonomous Intelligent Submunition (AIS) TD														
Avenger Air Defense System														
Battlefield Combat Identification (BCID) ATD														
Battlefield Combat Identification System (BCIS)														
Bayonet, Silent Kill														
Biological Integrated Detection System (BIDS)														
Biological Remote Early Warning Advanced Concept TD														
Bird Dog UAV														
Bistatic Radar														
Bradley Fighting Vehicle, 25mm Cannon														
Brilliant Anti-Armor Submunition (BAT)														
Brilliant Helicopter Advanced Weapons (BHAW) TD														
Chaparral														
Chemical Imaging Sensor Demonstration TD														
Combustion Engine Defeat Mechanism TD														
Compact Kinetic Energy Missile TD														

1 = Implement Area Fire Projection
2 = Apply Embedded Simulation (ES) to NLOS Engagements
3 = Pair Shooter to Victim
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5 = Field and Update Light Weight PDD
6 = Automate NBC/Smoke Effects
7 = Instrument UAV's and Interface Ground Control Station with IS
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9 = Automate EFOGM Simulation
10 = Automate RSTA Systems Detection Information
11 = Provide Tactile Feedback to Support Non-Lethal Engagements
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13 = Provide Virtual Simulation fo Artillery and Mortar Battlefield Effects
14 = Apply ES to Direct-Fire Systems for Point Target Engagements

SYSTEM NAME	CONCEPT IN RANK ORDER													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Crusader Howitzer														
Direct Fire Lethality ATD														
Electric Vehicle Stopper TD														
Electric Water Cannon														
Electronic Integrated Sensor Suite for Air Defense (EISS-AD) TD														
Enhanced Fiber Optic Guided Missile (EFOGM) ATD														
FAAD Ground Based Sensor														
Field Expedient Foam TD														
Firefinder Q36 Radar														
Firefinder Q37														
Full Spectrum Threat Protection TD														
Future Combat System (FCS)														
Future Infantry Fighting Vehicle (FIFV)														
Future Missile Technology Integration (FMTI)														
Future Scout and Cavalry System (FSCS) ATD														
Grizzly (formerly known as the M1 breacher)														
Ground Based Common Sensor														
Ground Based Sensor														
Ground Emplaced Mine Scattering System (GEMMS)														
Ground Surveillance Radar (GSR) AN/PPS-15														
Ground Surveillance Radar (GSR) AN/PPS-5														
Ground Vehicle Distributed Defense TD														
Guided Multiple Launch Rocket System (MLRS) ATD														
Hand Emplaced Wide Area Munition (WAM) M93														
High Mobility Artillery Rocket System (HIMARS) TD														
High Mobility Ground Launched AIM-120 Advanced Medium Range Air To Air Missile (AMRAAM) TD (HMGL-AMRAAM)														
Hit Avoidance ATD														
Hunter Sensor Suite (ATD)														
Hunter Unmanned Aerial Vehicle (UAV)														
HYDRA-70 Rocket System														
Improved REMBASS (IREMBASS)														
Indirect Precision Fire (IPF) ATD														
Integrated Acoustic system (IAS)														
Integrated Biodetection TD														
Integrated Sight (IS) TD														
Integrated Situational Awareness and Countermeasures (ISCAM) TD														
Intelligent Minefield (IMF) ATD														
Javelin, Anti-Tank Weapon														
Joint Chemical Agent Detector														

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SYSTEM NAME	CONCEPT IN RANK ORDER													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Joint Countermine Advanced Concept Technology Demonstration (CM ACTD)														
Joint Service Aviation Mask (JSAM)														
Joint Service General Purpose Mask (JSGPM)														
Joint Warning and Reporting Network														
Kinetic Energy Tungsten Core (KE-T) Round														
Kiowa OH-58D and RAH-66 Comanche HELLFIRE														
Kiowa OH-58D and RAH-66 Comanche HELLFIRE II														
Land Warrior System														
Light and Special Division Interim Sensor (LSDIS)														
Lightweight Airborne Multispectral Countermine Detection System TD														
Line of Sight Anti-Tank (LOSAT) ATD														
Linebacker														
Liquid Surface Detection TD														
Long Range Advanced Scout Surveillance System (LRAS3)														
Longbow Apache AH-64D Helicopter LONGBOW HELLFIRE Missile														
Low-Cost Precision Kill (LCPK) (ATG/GTG) 2.75 inch Guided Rocket TD														
M136 Light Anti-Tank Weapon (AT4)														
M16A2 Rifle														
M18A1, Claymore Mine														
M198, M102, M119, Towed Howitzers														
M203 Grenade Launcher														
M249 Squad Automatic Weapon (SAW)														
M47 Medium Anti-Tank Weapon (DRAGON)														
M58A4 Mine Clearing Line Charge (MICLIC)														
M72 Light Anti-Tank Weapon														
M829A2 Armor Piercing, Fin Stabilized, Discarding Sabot, Tracer (APFSDS-T) Round														
M830 High Explosive Anti-Tank Multipurpose (HEAT-MP-T) Round														
M93A1 FOX Nuclear, Biological, Chemical Reconnaissance System														
Machine Vision for Autonomous Unmanned Ground Vehicle (UGV) TD														
Maneuver UAV														
Masked Targeting TD														
Mechanized Smoke Generator M58 (Wolf)														
Mid-Sized Riot Control Dispenser TD														
Millimeter Wave Screening														
Mine Hunter Killer ATD														
MK-19 40mm Grenade Machine Gun														
Modular Pack Mine Systems (MOPMS)														
Moving Target Locating Radar (MTLR) AN/TPS-25A														
Moving Target Locating Radar (MTLR) AN/TPS-58B														
Multi-Purpose Individual Munition/Short Range Anti-Tank Weapon (MPIM/SRAW) TD														

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SYSTEM NAME	CONCEPT IN RANK ORDER													
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Multifunction Staring Sensor Suite ATD														
Multimission/Common Modular UAV Sensors TD														
Multimode Airframe Technology (MAT) TD (LONGFOG)														
Multiple Launch Rocket System (MLRS)														
Multipurpose Integrated Chemical Agent Alarm (MICAD)														
Multispectral Countermeasures (MSCM) ATD														
Multispectral Smoke														
Non-Lethal Entanglement TD														
Non-Lethal Marker Munition TD														
Objective Crew Served Weapon (OCSW)														
Objective Individual Combat Weapon (OICW)														
Objective Personal Weapon														
Objective Sniper Weapon														
Off Road Smart Mine Clearance														
ORION														
Paladin Howitzer														
Panther Mine Clearing System														
Precision Guided Mortar Munition (PGMM) ATD														
RAH-66 Comanche 20mm Chain Gun														
RAH-66 Comanche LONGBOW HELLFIRE Missile														
RAPTOR-Intelligent Combat Outpost														
Remotely Monitored Battlefield Sensor System (REMBASS)														
Robotic Countermine Vehicle (ROC-V)														
Rocket Assisted Projectile (RAP)														
Rotorcraft Air Combat Enhancement (RACE)														
Self-Propelled Howitzers M109A1, A2, A3, A4, A5														
Smoke Generator M56														
Stinger														
Synthetic Aperture Radar (SAR) Target Recognition and Location System (STARLOS)														
Tank Extended Range Munition (TERM) TD														
Target Acquisition ATD														
Target Defeat Capability TD														
Vehicular Mounted Mine Detector TD														
Volcano Multiple Delivery Mine System														
Vulcan														
Wolverine														

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